Series 1961, No. 6

Issued August 1964

SOIL SURVEY

Aroostook County, Maine Southern Part

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
in cooperation with
UNIVERSITY OF MAINE AGRICULTURAL EXPERIMENT STATION

HOW TO USE THE SOIL SURVEY REPORT

THIS SOIL SURVEY of the southern part of Aroostook County, Maine, will serve several groups of readers. It will help farmers in planning the kind of management that will protect their soils and provide good yields; assist engineers in selecting sites for roads, buildings, ponds, and other structures; aid foresters in managing woodlands; and add to our knowledge of soil science.

Locating the soils

Use the index to map sheets at the back of this report to locate areas on the large detailed map. The index is a small map of the county on which numbered rectangles have been drawn to show where each sheet of the large map is located. When the correct sheet of the large map has been found, it will be seen that boundaries of the soils are outlined, and that there is a symbol for each kind of soil. All areas marked with the same symbol are the same kind of soil, wherever they occur on the map. The symbol is inside the area if there is enough room; otherwise, it is outside the area and a pointer shows where the symbol belongs.

Finding information

This report contains sections that will interest different groups of readers, as well as some sections that may be of interest to all.

Farmers and those who work with farmers can learn about the soils in the section "Descriptions of the Soils" and then turn to the section "Use and Management of the Soils." In this way, they first identify the soils on their farm and then learn how these soils can be managed and what yields can be expected. The "Guide to Mapping Units, Capability Units, and Woodland Suitability Groups" at the back of the report will simplify use of the map and report. This guide lists each soil and land type mapped in the survey area, and the page where each is described. It also lists, for each soil and land type, the capability unit and woodland suitability group, and the pages where each of these are described.

Foresters and others interested in woodland can refer to the section "Forestry." In that section the soils in the survey area are grouped according to their suitability for trees, and factors affecting the management of woodland are explained.

Engineers and builders will want to refer to the section "Engineering Applications." Tables in that section show characteristics of the soils that affect engineering.

Scientists and others who are interested will find information about how the soils were formed and how they were classified in the section "Soil Formation and Classification."

Students, teachers, and other users will find information about soils and their management in various parts of the report, depending on their particular interest.

Newcomers to the southern part of Aroostook County will be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "General Nature of the Area," which gives additional information about the survey area.

* * * * *

Fieldwork for this survey was completed in 1960. Unless otherwise indicated, all statements in the report refer to conditions in the survey area at that time. The soil survey of the southern part of Aroostook County was made as part of the technical assistance furnished by the Soil Conservation Service to the Southern Aroostook Soil Conservation District.

Cover picture: Permanent pasture on Colton gravelly sandy loam. The kame and kettle topography is typical of Colton soils.

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Issued August 1964

SOIL SURVEY OF AROOSTOOK COUNTY, MAINE SOUTHERN PART

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SOILS SURVEYED BY J. S. HARDESTY, JOHN R. ARNO, R. A. BITHER, B. W. McEWEN, A. D. BACKER, AND A. P. FAUST, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE UNIVERSITY OF MAINE AGRICULTURAL EXPERIMENT STATION

THIS SOIL SURVEY covers 993,348 acres in the southern part of Aroostook County, Maine (fig. 1). For convenience, the area surveyed is referred to as Southern Aroostook County in many places in this report. It is bordered on the east by Canada, on the south by Washington and Penobscot Counties, on the west by Penobscot County, and on the north by the towns (or townships) of T8–R5, T8–R4, T8–R3, TC–R2, and Bridgewater.

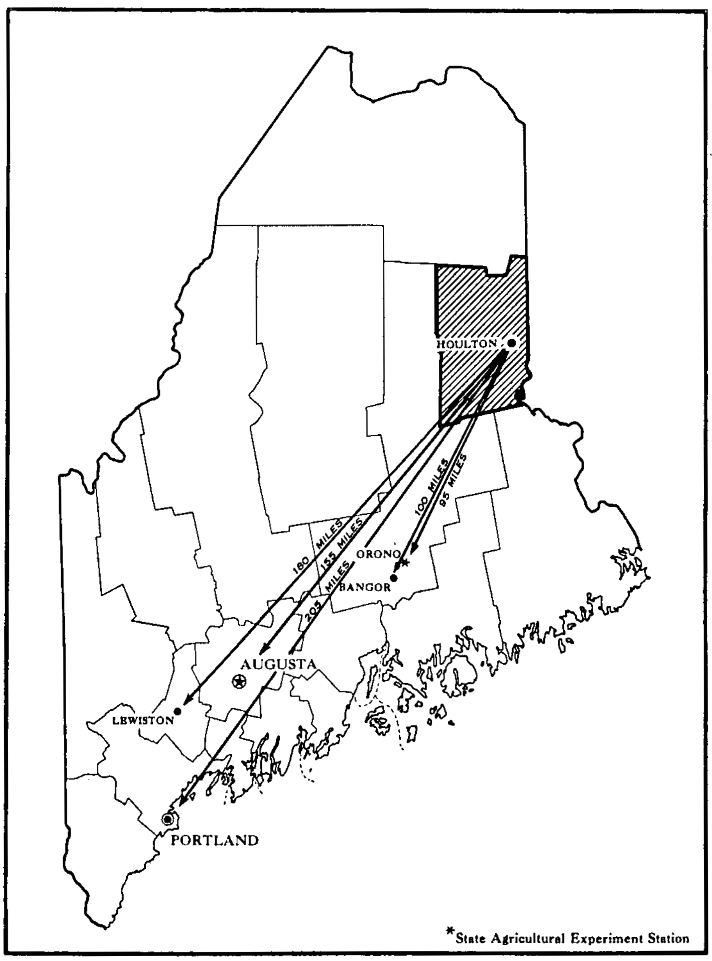

Figure 1.—**Location of southern part of Aroostook County in Maine.**

How Soils Are Named, Mapped, and Classified

Soil scientists made this survey to learn what kinds of soils are in Southern Aroostook County, where they are located, and how they can be used.

They went into the area knowing they likely would find many soils they had already seen, and perhaps some they had not. As they traveled over the area, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug or bored many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down to the rock material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in areas nearby and in places more distant. They classified and named the soils according to uniform procedures. To use this report efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Mapleton and Perham, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in natural characteristics.

Many soil series contain soils that are alike except for texture of their surface layer. According to this difference in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Mapleton shaly silt loam and Mapleton very rocky silt loam are two soil types in the Mapleton series. The difference in texture of their surface layers is apparent from their names.

Some soil types vary so much in slope, degree of erosion, number and size of stone, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into soil phases.

The name of a soil phase indicates a feature that affects management. For example, Mapleton shaly silt loam, 0 to 8 percent slopes, is one of several phases of Mapleton shaly silt loam, a soil type that ranges from nearly level to steep.

After a fairly detailed guide for classifying and naming the soils had been worked out, the soil scientists drew soil boundaries on aerial photographs. They used photos for their base map because they show woodlands, buildings, field borders, trees, and similar details that greatly help in drawing boundaries accurately. The soil map in the back of this report was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil type or soil phase.

In preparing some detailed maps, the soil scientist may show as one mapping unit two or more soils that do not occur in regular geographic associations. Such a mapping unit is called an undifferentiated soil group. An example in Southern Aroostook County is Monarda and Burnham silt loams, 0 to 2 percent slopes.

Also, in most mapping, there are areas to be shown that are so rocky, so shallow, or so frequently worked by wind and water that they cannot be called soils. These areas are shown on a soil map like other mapping units, but they are given descriptive names, such as Made land or Mixed alluvial land, and are called land types rather than soils.

After the soil scientists had named and described the soil series and mapping units and had shown the location of the mapping units on the soil map, there was additional work to be done. The mass of detailed information they had recorded needed to be presented in different ways for different groups of users, among them farmers, managers of woodland, and engineers. To do this efficiently, the soil scientists had to consult with persons in other fields of work and jointly prepare with them groupings that would be of practical value to different users. Such groupings are the capability classes, subclasses, and units, designed primarily for those interested in producing the short-lived crops and tame pasture; woodland suitability groups, for those who need to manage wooded tracts; and the classifications used by engineers who build highways or structures to conserve soil and water.

General Soil Map

After study of the soils in a locality and the way they are arranged, it is possible to make a general map that shows several main patterns of soils, called soil associations. Such a map is the colored general soil map in the back of this report. Each association, as a rule, contains a few major soils and several minor soils, in a pattern that is characteristic although not strictly uniform.

The soils within any one association are likely to differ in some or in many properties; for example, slope, depth, stoniness, or natural drainage. Thus, the general soil map shows, not the kind of soil at any particular place, but patterns of soils, in each of which there are several different kinds of soils.

Each soil association is named for the major soil series in it, but, as already noted, soils of other series may also be present. The major soils of one soil association may also be present in other associations, but in a different pattern.

The general map is useful to people who want a general idea of the soils, who want to compare different parts of a county, or who want to know the possible location of good-sized areas suitable for a certain kind of farming or other land use.

The occurrence of specific kinds of wildlife in each soil association is described in the section entitled "Wildlife."

1. Caribou-Mapleton-Conant association: Gently rolling soils on till derived chiefly from limestone

This association is made up mainly of soils on gently rolling upland ridges of slightly acid to neutral glacial till. It occurs in the townships that border Canada and extends from south of Hodgdon to north of Bridgewater. It also occurs in the townships of Linneus and New Limerick.

About 45 percent of this association is made up of the well-drained Mapleton soils, which are generally less than 20 inches thick over calcareous shale bedrock. The well-drained Caribou soils, which are deep and were derived from limestone glacial till, comprise about 22 percent of the acreage. The moderately well drained Conant soils make up about 12 percent. They are in depressions scattered throughout the other soils. The well-drained, shallow to moderately deep Linneus soils comprise about 5 percent of the acreage and are common in Linneus and New Limerick Townships.

About 75 percent of the acreage of this association is used for growing potatoes in a rotation with oats and a grass-clover sod crop. The soils and climate are well suited to this type of farming, and the soils respond to good management that includes large applications of fertilizer.

Much of this association consists of shallow to moderately deep soils that have a moderately low capacity to store water. As a result, water needs to be conserved.

Drainage of the scattered, moderately wet areas will permit fieldwork earlier in spring. Two or more different soils of this association generally occur on each farm, and, therefore, management is somewhat difficult. The average farm contains 120 acres, but farm units are increasing in size. In places two or more farms are managed as a unit.

2. Plaisted-Perham-Howland association: Smoothly sloping soils on till derived chiefly from acid rocks

This association is made up of soils on broad ridges of compact, acid glacial till. The soils are characterized by a firm subsoil. Most of the areas are in the northwestern and south-central parts of the survey area.

The well-drained Plaisted and Perham soils comprise about 45 percent of this association; the Plaisted soils make up most of this percentage. Both kinds of soils developed on the sides and tops of glacial till ridges, commonly on slopes of less than 15 percent.

The moderately well drained to somewhat poorly drained Howland and Daigle soils make up approximately 25 percent of the association. The Howland soils predominate. The Howland and Daigle soils are in depressions and seepage areas on the tops and sides of the ridges. They generally have slopes of less than 8 percent, but in some areas there are slopes of 15 percent.

Most of this association is forested, but some areas in Sherman, Crystal, Hersey, and Dyer Brook Townships have been cleared and cultivated. Soils of forested areas are generally stony, and the stones must be removed before they can be used for crops. Land in farms is used chiefly for potatoes, oats, hay, and pasture. Most farms are 120 acres in size, and about half the acreage is cropland and half is pasture.

3. Thorndike-Howland association: Irregularly sloping soils on till derived chiefly from acid rocks

The soils of this association are mainly on irregular, broken knolls and hills. They formed in acid glacial till and are mostly moderately deep to shallow over bedrock. The layer of glacial till conforms in shape to the underlying folded, angular, and ribbed shale bedrock.

The Thorndike soils are shaly or very rocky and occupy irregularly rolling hills. The shaly Thorndike soils are more common than the very rocky ones and generally have slopes of less than 15 percent. The very rocky Thorndike soils normally have very rough relief. Most of the slopes are steeper than 10 percent.

The Howland soils are in moderately wet depressions and seepage areas. These soils are deeper than the Thorndike soils, and they have a smooth surface. They occur mainly in long, narrow areas between moderately deep and shallow soils.

About 20 percent of this association is clear of trees and surface stones and is being used to grow potatoes, small grains, and hay. Some additional land was once cleared for crops but has reverted to woodland. The largest part of the area, however, has never been cleared of trees. The forests provide maple, beech, and birch for lumber and firewood.

The soils of this association are somewhat difficult to farm because of irregular slopes and a few outcrops of bedrock. In many places the slopes are broken and irregular. This restricts the use of contour tillage and increases the hazard of erosion when row crops are grown.

4. Colton-Machias association: Nearly level to sloping soils on terraces, eskers, and glacial outwash

The soils of this association occur as long, narrow bands or glacial ridges near the larger streams. The ridges, called eskers (fig. 2), are occupied chiefly by the somewhat excessively drained Colton soils, which have also developed on terraces and glacial outwash. Where they occur on eskers, the Colton soils generally have slopes of more than 8 percent, but where they occur on terraces and glacial outwash, they generally have slopes of less than 8 percent.

Figure 2.—**Typical relief of Colton soils that have developed on an esker. The esker extends from north to south for many miles.**

The moderately well drained Machias soils developed in depressions on the terraces and on glacial outwash. These soils generally have slopes of less than 8 percent.

Less than 20 percent of this association is used for crops. Most of the acreage of sloping Colton soils is still forested because the soils are slightly droughty and difficult to manage for row crops. A greater percentage of the acreage of the Machias soils is used for crops, even though these soils are only moderately well drained. A few farms are on soils of this association, but most farms also contain soils of other associations.

5. Monarda-Burnham association: Nearly level to gently sloping, poorly drained soils on firm till

The soils of this association occur chiefly in long, narrow bands that border streams. In some places the narrow bands broaden out into flat, wet swampy areas. The very poorly drained Burnham soils developed in depressions, and the poorly drained Monarda soils, in nearly level areas. Both the Monarda and Burnham soils formed in till derived mainly from shale, slate, and phyllite.

Most areas are forested and stony, but small areas of the Monarda soils have been cleared and used for pasture. Spruce and fir trees are usually harvested for pulpwood.

Use and Management of the Soils

In this section the capability classification used by the Soil Conservation Service is briefly explained. Next, the soils are placed in capability units, or management groups, and the management for each unit is discussed. Finally, estimated average acre yields of crops are given for the cultivated soils under two levels of management.

The use of the soils for forestry, wildlife habitats, and engineering purposes is discussed in separate sections.

Capability Groups of Soils

The capability classification is a grouping that shows, in a general way, how suitable the soils are for most kinds of farming. It is a practical grouping based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment.

In this system all the kinds of soil are grouped at three levels, the capability class, subclass, and unit. The eight capability classes in the broadest grouping are designated by Roman numerals I through VIII. In class I are the soils that have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. In class VIII are soils and landforms so rough, shallow, or otherwise limited that they do not produce worthwhile yields of crops, forage, or wood products.

The subclasses indicate major kinds of limitations within the classes. Within most of the classes there can be up to four subclasses. The subclass is indicated by adding

a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* means that water in or on the soil will interfere with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the country, indicates that the chief limitation is climate that is too cold or too dry.

Some of the soils in Southern Aroostook County have two kinds of limitations. These soils have been placed in units, such as IIIew, that have two letters designating the subclass.

In class I there are no subclasses, because the soils of this class have few or no limitations. Class V can contain, at the most, only subclasses *w*, *s*, and *c*, because the soils in it have little or no erosion hazard but have other limitations that limit their use largely to pasture, range, woodland, or wildlife.

Within the subclasses are the capability units, groups of soils enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally identified by numbers assigned locally, for example, IIe-1 or IIIe-3.

Soils are classified in capability classes, subclasses, and units in accordance with the degree and kind of their permanent limitations; but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soil; and without consideration of possible but unlikely major reclamation projects.

The eight classes in the capability system, and the subclasses and units in this county, are described in the list that follows.

Class I. Soils that have few limitations that restrict their use. (No class I soils in Southern Aroostook County.)

Class II. Soils that have some limitations that reduce the choice of plants or require moderate conservation practices.

- Subclass IIc. Soils limited chiefly by the short growing season.
  - Unit IIc-3.—Deep, nearly level, well-drained soils on glacial till; gravelly loam or gravelly silt loam surface layer.
  - Unit IIc-5.—Deep, nearly level, well-drained soil on terraces and glacial outwash.
  - Unit IIc-6.—Deep, nearly level, well-drained soil on bottom lands not subject to damaging overflow.
- Subclass IIe. Gently sloping soils subject to moderate erosion if they are not protected.
  - Unit IIe-1.—Moderately deep to shallow, gently sloping and undulating, well-drained soils on glacial till.
  - Unit IIe-3.—Deep, gently rolling, well-drained soils on glacial till.
  - Unit IIe-5.—Deep, gently sloping, well-drained soil on terraces and glacial outwash.
- Subclass IIw. Soils moderately limited by excess water.
  - Unit IIw-4.—Deep, nearly level to gently sloping, moderately well drained soils in glacial till; silt loam or gravelly loam surface layer.
  - Unit IIw-5.—Deep, level to gently sloping, moderately well drained soils on terraces and glacial outwash; gravelly loam surface layer.
  - Unit IIw-6.—Deep, nearly level, moderately well drained soil on bottom lands.
- Subclass IIs. Soils moderately limited by a shallow root zone.
  - Unit IIs-5.—Deep, nearly level to gently sloping, somewhat excessively drained gravelly soils on terraces, eskers, kames, and glacial outwash.

Class III. Soils that have severe limitations that reduce the choice of plants, or require special conservation practices, or both.

- Subclass IIIe. Sloping soils subject to moderate and severe erosion if they are cultivated and not protected.
  - Unit IIIe-1.—Moderately deep to shallow, sloping or rolling, well-drained soils on glacial till; shaly silt loam surface layer.
  - Unit IIIe-3.—Deep, sloping, well-drained soils on glacial till; gravelly loam, gravelly silt loam, or silt loam surface layer.
- Subclass IIIew. Sloping soils that are subject to severe erosion and are also severely limited by excess water.
  - Unit IIIew-4.—Deep, sloping to strongly sloping, moderately well drained soils on terraces; silt loam or gravelly loam surface layer.
  - Unit IIIew-5.—Deep, sloping, moderately well drained soil on terraces and glacial outwash; gravelly loam surface layer.
- Subclass IIIes. Sloping soils that are subject to severe erosion and drought.
  - Unit IIIes-5.—Sloping, somewhat excessively drained soil on glacial outwash, eskers, kames, or terraces; soil has a gravelly loam surface layer and is shallow to gravel.

Class IV. Soils that have very severe limitations that restrict the choice of plants, require very careful management, or both.

- Subclass IVe. Soils subject to very severe erosion if they are cultivated and not protected.
  - Unit IVe-1.—Rolling to strongly rolling, well-drained soils on glacial till; soils have a shaly silt loam surface layer and are shallow to bedrock.
  - Unit IVe-3.—Deep, strongly sloping, well-drained soils on glacial till.
- Subclass IVes. Strongly sloping soils subject to very severe erosion and drought.
  - Unit IVes-5.—Moderately steep, somewhat excessively drained soil on glacial outwash, kames, and eskers; soil has a gravelly sandy loam surface layer and is shallow to gravel.
- Subclass IVw. Soils very severely limited by excess water.

Unit IVw-3.—Deep, level or gently sloping, poorly and very poorly drained soils on glacial till; silt loam surface layer.

Unit IVw-5.—Deep, level or gently sloping, poorly and very poorly drained soils on terraces or glacial outwash; silt loam surface layer.

Class V. Soils not likely to erode that have other limitations, impractical to remove without major reclamation, that limit their use largely to pasture or range, woodland, or wildlife food and cover. (No class V soils in Southern Aroostook County.)

Class VI. Soils that have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture, woodland, or wildlife food and cover.

Subclass VIe. Soils severely limited, chiefly by risk of erosion if protective cover is not maintained.

Unit VIe-3.—Deep, steep, well-drained loamy soil on glacial till.

Subclass VIw. Soils severely limited by excess wetness and very frequent flooding.

Unit VIw-6—Deep, nearly level, poorly drained land type on bottom lands subject to very frequent flooding.

Subclass VIs. Soils limited by being very stony or very rocky.

Unit VIs-1.—Gently sloping or moderately sloping, very rocky and shaly soils on glacial till; shallow to bedrock.

Unit VIs-3.—Mainly deep, gently sloping and moderately steep, well drained and moderately well drained, very stony soils on glacial till.

Class VII. Soils that have very severe limitations that make them unsuitable for cultivation without major reclamation, and that restrict their use largely to grazing, woodland, or wildlife.

Subclass VIIes. Soils very severely limited by steep slopes, risk of erosion, and low moisture capacity.

Unit VIIes-5.—Steep, somewhat excessively drained soil on glacial outwash, terraces, and eskers; shallow to gravel.

Subclass VIIw. Soils very severely limited by excess water.

Unit VIIw-9.—Very wet organic soils.

Subclass VIIs. Soils severely limited because they have steep slopes and are very stony, rocky, or droughty.

Unit VIIs-1.—Rolling to steep, shallow, very rocky and shaly soils.

Unit VIIs-3.—Steep, very stony, deep, well-drained soil on glacial till.

Subclass VIIsw. Soils limited by properties that adversely affect soil depth and by excess water during part of the growing season.

Unit VIIsw-3.—Deep, level to gently sloping, very stony, poorly and very poorly drained soil on glacial till.

Class VIII. Soils and landforms that have limitations that preclude their use, without major reclamation, for commercial production of plants, and that restrict their use to recreation, wildlife, water supply, or esthetic purposes.

(No class VIII soils in Southern Aroostook County.)

Management by Capability Units

In this section all the soils, except Made land, have been placed in capability units. The use and management and limiting factors of the soils of each capability unit are described. This information will serve as a general guide for managing the soils, but, for more specific information, it is best to consult the technical people who work with the Southern Aroostook Soil Conservation District.

The raising of potatoes and dairying are the main agricultural enterprises in Southern Aroostook County. There are a few highly specialized potato-producing farms. Many farms produce both potatoes and dairy products.

Fertilizer and lime are used on all commercial farms. The amounts applied are usually based on the results of soil tests made by the Maine Agricultural Experiment Station and Extension Service.

Capability unit IIc-3

In this capability unit are deep, well-drained, nearly level, medium-textured soils that have formed on glacial till in the uplands. The soils generally occur on tops of ridges where air drainage is good. In their upper 30 inches, they hold more than 4 inches of moisture available for crops. Surface runoff is slow. The Caribou soil is moderately permeable to a depth of more than 30 inches, and the Perham soil, to about 30 inches. The soils in this unit are—

Caribou gravelly loam, 0 to 2 percent slopes.
Perham gravelly silt loam, 0 to 2 percent slopes.

Potatoes and most other cultivated crops that mature in less than 120 days can be grown continuously on these soils. Oats, grasses, and legumes are often grown in a rotation with potatoes, however. The soils, especially the Perham, should be managed in such a way that water will not stand between crop rows. Consistently high yields of crops can be obtained if adequate amounts of fertilizer and lime are applied and if plant diseases are controlled. Because of good air drainage on these soils, the frost-free season is a few days longer than normal and the hazard of plant diseases is limited.

Capability unit IIc-5

In this capability unit is a deep, nearly level, well-drained soil on glacial outwash and terraces. The soil has good water-holding capacity and moderate permeability. Surface runoff is slow. The soil is—

Stetson gravelly loam, 0 to 2 percent slopes.

This soil responds to good management and can be used for any crop suited to the climate. Potatoes can be grown continuously, but rotating them with other crops helps to control plant diseases and insects. Fertilizer and lime are needed for high yields.

Capability unit IIc-6

This capability unit is made up of a deep, well-drained, nearly level soil on bottom lands at low levels. More than 4 inches of water that is available for plants can be held in the upper 30 inches of the profile. The soil in this unit is—

Hadley silt loam.

This soil is used for potatoes, small grains, clovers, and grasses. Because the soil occurs in valleys at low eleva-

tions, it is subject to frosts early in fall. This limits the kinds of crops that can be grown, but the frost-free season is long enough to permit the growing of the crops just mentioned. Natural air drainage is poor, and, therefore, potato plants stay damp late in the day during the season of heavy dew. Consequently, additional applications of fungicide spray may be needed in years when late blight of potatoes is prevalent. Good management is needed to maintain the content of organic matter and the fertility of the soil.

Sometimes this soil is flooded when ice dams up water early in spring, but erosion or deposition of soil material seldom results. In some places streambanks are eroded at this time of year, but this hazard can be limited by maintaining vegetation on the banks.

Capability unit IIe-1

In this unit are well-drained, moderately deep to shallow soils on glacial till derived from weakly calcareous shale and limestone. Relief is gently rolling or undulating. Surface runoff is medium, and permeability is moderate. The soils have only moderate water-holding capacity, but water held in the soils is readily available to plants. The soil material over the bedrock is friable and is easily penetrated by roots. The soils in this unit are—

Mapleton shaly silt loam, 0 to 8 percent slopes.
Thorndike shaly silt loam, 0 to 8 percent slopes.

Potatoes are the principal cash crop grown on these soils, and yields are nearly as high as those obtained on deep soils.

Except for a few rock outcrops, the soils are easy to manage. There are spots in most fields where shale is within plow depth and is a hazard to farm machinery. Most of the soil in any field is more than 16 inches thick; roots extend to this depth and even into seams in the bedrock. Therefore, crops are seldom affected by short droughts.

Contour stripcropping will conserve most of the rainfall and help to increase yields of potatoes in dry seasons, as well as to limit loss of soil during rainy seasons. Growing potatoes year after year seldom causes soil structure to be destroyed, but it reduces the organic-matter content of the soils and increases the hazard of erosion. These hazards can be reduced by using a rotation that includes grasses and legumes. Such plants produce good yields on the soils.

Capability unit IIe-3

In this unit are deep, medium-textured, well-drained, gently sloping soils on glacial till in the uplands. In their upper 30 inches, the soils hold more than 4 inches of water available to plants. Surface runoff is medium. The soils in this unit are—

Caribou gravelly loam, 2 to 8 percent slopes.
Linneus silt loam, 0 to 8 percent slopes.
Perham gravelly silt loam, 2 to 8 percent slopes.
Plaisted gravelly loam, 0 to 8 percent slopes.

These soils make up the most extensive areas used for potatoes. Most of the areas are large and broad. This permits the use of the heavy, highly specialized farm machinery needed in the growing and harvesting of potatoes.

Soil and water can be conserved through the use of contour farming, stripcropping, diversion ditches, and sod waterways. If used where necessary, these practices also help to increase yields of crops.

The Plaisted and Perham soils have a compact subsoil that impedes the movement of water. The hazard of excess moisture during periods of heavy rainfall can be limited and soil loss can be reduced if the soils are farmed in strips slightly off the contour.

Large yields of potatoes, oats, grasses, and legumes can be obtained if the soils are fertilized and limed.

Capability unit IIe-5

This unit consists of a deep, well-drained, gently sloping soil on terraces and glacial outwash. The soil has medium internal drainage and medium surface runoff. In the top 30 inches, it holds more than 3½ inches of water available to plants. The soil in this unit is—

Stetson gravelly loam, 2 to 8 percent slopes.

This soil is easy to manage and can be farmed as soon as it thaws. It should be farmed on the contour to conserve rainfall and to limit the hazard of erosion. High yields of potatoes, oats, grasses, and legumes can be obtained if adequate amounts of fertilizer and lime are applied. The supply of organic matter should be increased to help hold moisture in the soil.

Capability unit IIw-4

This unit is made up of deep, moderately well drained soils in depressions in glacial till ridges in the uplands. Three of the soils are nearly level, and three are gently sloping. A firm layer below a depth of 15 inches holds water close to the surface. Surface runoff is slow on the soils with slopes of 0 to 2 percent and moderate on the soils with slopes of 2 to 8 percent. The soils in this unit are—

Conant silt loam, 0 to 2 percent slopes.
Conant silt loam, 2 to 8 percent slopes.
Daigle silt loam, 0 to 2 percent slopes.
Daigle silt loam, 2 to 8 percent slopes.
Howland gravelly loam, 0 to 2 percent slopes.
Howland gravelly loam, 2 to 8 percent slopes.

Normally, these soils are farmed in a rotation consisting of potatoes, oats, and hay. The hay crop is often left on the same field for 2 or more years.

The use of these soils is slightly limited by slow internal drainage. In spring, fieldwork must be delayed until the soils have lost their excess moisture. In unusually rainy springs, these soils remain wet so late that they cannot be planted to potatoes. Nevertheless, even in unusually wet springs, they can be used for growing oats, a crop that has a very short growing season.

If they are drained, these soils can be farmed more intensively and consistently higher yields can be obtained. They can be drained through open ditches, diversion ditches, and tile drains. Tile drains are usually preferred, except possibly in the Daigle soils, which have a heavier subsoil through which water moves slowly. Open ditches are cheaper to construct than a tile drainage system, but they hinder farm operations and must be maintained. It is somewhat more difficult to establish outlets on slopes of 0 to 2 percent than on slopes of 2 to 8 percent.

The more strongly sloping soils are subject to erosion if planted to a row crop. Contour cropping can be done on slopes as much as 300 feet in length. Longer slopes, however, need to be divided into strips 200 feet wide. The strips of cultivated crops should be laid out and planted on the contour. One strip in three should be left over winter in a crop that protects against erosion. Diversion ditches are needed on the long, steeper slopes to help control erosion and to intercept water that moves horizontally through the subsoil. The ditches should be as steep as possible without causing scouring.

Capability unit IIw-5

This unit is made up of deep, moderately well drained soils on terraces and glacial outwash. The soils are level to gently sloping. Surface runoff is slow to medium. The soils in this unit are—

Machias gravelly loam, 0 to 2 percent slopes.
Machias gravelly loam, 2 to 8 percent slopes.

These soils are used for potatoes, small grains, clovers, and grasses. They are easier to drain and to work than most moderately well drained soils in the area. High yields of potatoes cannot be obtained consistently unless drainage is improved. Tile will drain most large areas of these soils. In addition to potatoes, other crops that are normally grown will benefit from drainage.

The soils are subject to slight or moderate erosion when planted to a row crop. Contour cropping can be used on short slopes, or those generally less than 300 feet long. Longer slopes need to be divided into strips 200 feet wide. Strips in a cultivated crop should be planted on the contour. One strip in three should be left over winter in a crop that protects against erosion. Diversion ditches are needed on the long, steeper slopes to help control erosion and to intercept water that moves down the slope through the subsoil. The ditches should be as steep as possible without causing scouring.

Capability unit IIw-6

In this unit is a deep, moderately well drained silt loam soil on bottom lands. Relief is nearly level, and internal drainage and surface runoff are slow. The soil in this unit is—

Winooski silt loam.

This soil is used for potatoes, small grains, clovers, and grasses. It occurs at low elevations and is subject to early frosts and other climatic conditions similar to those of the Hadley soils. Tile drains will remove enough water so that the soil will produce consistently good yields of potatoes. Drainage also permits fieldwork on this soil earlier in spring and later in fall.

This soil is sometimes flooded when ice dams up water early in spring, but erosion or the deposition of soil material seldom results. In some places, however, streambanks are eroded early in spring. This hazard can be limited by maintaining vegetation on the banks.

Capability unit IIs-5

This capability unit consists of deep, somewhat excessively drained gravelly soils on terraces, eskers, kames, and glacial outwash. The soils are nearly level to gently sloping. They have moderately rapid internal drainage because their texture is gravelly loamy sand below a depth of 12 to 18 inches. The water-holding capacity is moderately low, and surface runoff is slow to medium. The soils in this unit are—

Colton gravelly sandy loam, dark materials, 0 to 2 percent slopes.
Colton gravelly sandy loam, dark materials, 2 to 8 percent slopes.

Potatoes, oats, and hay are grown on these soils, but yields are usually lower than those obtained on the well-drained soils. The soils of unit IIs-5 are slightly droughty and need water-conserving practices to produce high yields of crops. The more nearly level areas can be irrigated if a supply of water is available. The growing of green-manure crops adds organic matter to the soil and helps to increase the water-holding capacity. Contour stripcropping helps to hold most of the rainfall on the soils and to increase yields.

Capability unit IIIe-1

Well-drained, moderately deep to shallow soils on glacial till derived from weakly calcareous shale and limestone are in this capability unit. Relief is sloping or rolling and is irregular in many places. Surface runoff is medium to rapid, and permeability is moderate. The water-holding capacity is only moderate, but most of the water is readily available to plants. The soils are friable, and roots usually penetrate to bedrock. The soils in this unit are—

Mapleton shaly silt loam, 8 to 15 percent slopes.
Thorndike shaly silt loam, 8 to 15 percent slopes.

Potatoes, oats, and a grass-legume mixture make up the rotation usually followed on the soils of unit IIIe-1.

These soils are moderately difficult to manage because they are sloping and the fields contain spots where rocks are within plow depth. In most fields the soils are deep enough to produce a good crop of potatoes, but unless rainfall is conserved, yields may be lower than those obtained on the soils of unit IIe-1.

The soils of unit IIIe-1 are erodible and should be farmed on the contour. Fields with long slopes should be divided into strips, and the strips farmed on the contour. Strips, 200 feet wide, in a cultivated crop and alternate strips in a sod crop will limit soil washing. Diversion ditches can be used to shorten the length of slopes and to divert water away from lower fields.

Capability unit IIIe-3

This capability unit is made up of deep, sloping, well-drained soils on glacial till in the uplands. In their upper 30 inches, the soils hold more than 4 inches of water available to plants. They have moderately rapid surface runoff. The Perham and Plaisted soils have a compact subsoil. The soils in this unit are—

Caribou gravelly loam, 8 to 15 percent slopes.
Linneus silt loam, 8 to 15 percent slopes.
Perham gravelly silt loam, 8 to 15 percent slopes.
Plaisted gravelly loam, 8 to 15 percent slopes.

These soils are somewhat difficult to farm, but they respond well to good management. Much of the rainfall is lost through runoff, unless the soils are farmed across the slope. The Caribou and Linneus soils can be farmed on

the contour, but the Perham and Plaisted soils should be farmed slightly off the contour to provide some surface drainage. In many places diversion ditches are needed to carry off excess rainfall. Consistently high yields of potatoes, oats, grasses, and legumes can be produced if the soils are adequately fertilized, limed, and otherwise properly managed.

Capability unit IIIew-4

This unit is made up of deep, moderately well drained, sloping to strongly sloping soils on terraces of glacial till. A firm layer below a depth of 15 inches impedes the downward movement of water. Surface runoff is medium to rapid. The soils in this unit are—

Conant silt loam, 8 to 15 percent slopes.
Daigle silt loam, 8 to 15 percent slopes.
Howland gravelly loam, 8 to 15 percent slopes.

These soils are used for potatoes, small grains, clovers, and grasses. They are subject to erosion and have restricted drainage. Because of these limitations, the soils are difficult to manage when planted to a cultivated crop. They produce large yields of selected mixtures of grasses and legumes without artificial drainage or erosion control practices.

Cultivated crops should be planted about on the contour, but slightly offgrade to provide surface drainage. Diversion ditches and outlets will improve drainage and help to control erosion. Tile can be used to drain wet spots.

Capability unit IIIew-5

This unit is made up of a deep, moderately well drained, sloping soil on terraces and glacial outwash. This soil receives water from higher surrounding areas. Surface runoff is rapid. The soil in this unit is—

Machias gravelly loam, 8 to 15 percent slopes.

This soil is used for potatoes, small grains, clovers, and grasses. The areas, especially the steeper ones, are difficult to cultivate. Most slopes are short and abrupt, in contrast to the long, broad slopes of the soils in capability unit IIIew-4.

The steeper areas of this soil can best be used for permanent hay or pasture.

Capability unit IIIes-5

This capability unit consists of a somewhat excessively drained soil on eskers, kames, or glacial outwash. The soil is sloping and has medium to rapid surface runoff. It has moderately rapid permeability and moderately low water-holding capacity. In general, gravelly loamy sand is present below a depth of 12 to 15 inches. The soil in this unit is—

Colton gravelly sandy loam, dark materials, 8 to 15 percent slopes.

This soil is slightly droughty and is subject to erosion. Management practices that conserve moisture and soil are needed when cultivated crops are grown. A high content of organic matter should be maintained through the use of green-manure crops. When the soil is used in a rotation that includes potatoes, the fields should be planted in strips on the contour. On long slopes diversion ditches will limit the loss of soil.

Capability unit IVe-1

This capability unit consists of well-drained, shallow soils on glacial till derived from shale and limestone. These soils are rolling to strongly rolling. Surface runoff is rapid, and permeability is moderate. The soils in this unit are—

Mapleton shaly silt loam, 15 to 35 percent slopes.
Thorndike shaly silt loam, 15 to 25 percent slopes.

These soils are difficult to farm because they are steep and contain many rock outcrops. The severe hazard of erosion, irregular slopes, and rock outcrops limit the length of rows that can be laid out on the contour.

The soils can be used for potatoes grown as part of a long rotation. Fields should be divided into strips and, if possible, farmed on the contour. Diversion ditches should be used wherever possible to limit further loss of soil.

These soils can be managed more easily if they are used for hay or pasture. They will need to be limed or fertilized, however. Pastures need to be seeded to adapted grasses and legumes and to be clipped or sprayed for the control of weeds.

Capability unit IVe-3

In this unit are deep, well-drained gravelly loam and gravelly silt loam soils on glacial till in the uplands. The soils are strongly sloping and have medium internal drainage and rapid surface runoff. The soils in this unit are—

Caribou gravelly loam, 15 to 25 percent slopes.
Linneus silt loam, 15 to 35 percent slopes.
Perham gravelly silt loam, 15 to 25 percent slopes.
Plaisted gravelly loam, 15 to 25 percent slopes.

These soils are used mainly for hay and pasture and occasionally for potatoes and small grains. Steep slopes and the hazard of erosion limit their use for cultivated crops.

The soils produce good yields of grasses and legumes, if adequately fertilized and limed. They are difficult to manage when used for row crops, however. If used for potatoes, they should be farmed on the contour to conserve rainfall and to limit the hazard of erosion. On long slopes, diversion ditches are needed to carry excess rainfall off the fields.

Capability unit IVes-5

This unit consists of a somewhat excessively drained soil that is shallow to gravel. This soil is on eskers, kames, and glacial outwash. It has moderately steep, irregular slopes, rapid surface runoff, moderately rapid permeability, and moderately low water-holding capacity. It is generally made up of gravelly loamy sand below a depth of 12 inches. The soil in this unit is—

Colton gravelly sandy loam, dark materials, 15 to 25 percent slopes.

This soil is slightly droughty and is subject to erosion. Practices that conserve moisture and soil are needed when cultivated crops are grown. A high content of organic matter should be maintained through the growing of green-manure crops. When the soil is used in a rotation that includes potatoes, the fields should be planted in strips on the contour. On long slopes diversion ditches will limit further loss of soil.

This soil is difficult to use for row crops, and it is more easily managed when used for permanent hay. Deep-rooted legumes can be grown. At the time of seeding, the soil should be limed and fertilized so that the legumes can become established.

Capability unit IVw-3

This unit is made up of deep, level or gently sloping, poorly and very poorly drained soils in depressions. The soils formed on glacial till. They have a compact subsoil and a high water table that impede internal drainage. They have slow surface runoff. The soils in this unit are—

Monarda and Burnham silt loams, 0 to 2 percent slopes.
Monarda and Burnham silt loams, 2 to 8 percent slopes.

Grasses and trees grow on these soils. Yields of grasses are usually low, or the forage is of poor quality. There are good stands of spruce and fir trees, however. In some years the soils can be used for a row crop.

Water stands near the surface of the soils during 9 months of the year. Open drains will remove some of the water, but in most places the soils cannot be drained well enough to produce good yields of row crops. In many areas with slopes of 0 to 2 percent, it is difficult to find suitable outlets for drains. Improved drainage will permit the growing of grasses of high quality and make the harvesting of hay easier. Because the soils are in depressions, their growing season is not so long as that of soils at higher elevations. Livestock should not graze pastures until the soils become firm.

Capability unit IVw-5

This unit consists of deep, poorly and very poorly drained soils on terraces and glacial outwash. Relief is level or gently sloping, and surface runoff is slow. The soils in this unit are—

Red Hook and Atherton silt loams, 0 to 2 percent slopes.
Red Hook and Atherton silt loams, 2 to 8 percent slopes.

These soils are used for hay, pasture, and woodland and, where adequately drained, for an occasional row crop. Even after drainage improvement, the soils warm up slowly in spring. Potatoes are seldom grown, because they cannot be planted early enough in spring to provide good yields. High yields of hay can be obtained, however.

Open ditches will help to remove surface water and thereby permit the growing of high-quality grasses. It is somewhat difficult to find suitable outlets for drains on slopes of 0 to 2 percent.

Most of the acreage of these soils has a cover of spruce and fir.

Capability unit VIe-3

In this unit is a deep, medium-textured, well-drained soil on firm glacial till. Relief is steep, internal drainage is medium, and surface runoff is rapid. The soil is—

Caribou gravelly loam, 25 to 45 percent slopes.

This soil can be used for pasture. Some of the less sloping areas are suitable for hay. Good yields of grasses and clovers are obtained, especially early in summer. The soil is well suited to deep-rooted legumes, such as alfalfa, which provides large yields of forage during midsummer. Lime and fertilizer are needed at seeding time. Fertility should be maintained by the addition of phosphate and potash. Lime needs to be applied, whenever necessary, to maintain a soil pH of about 6.5. Pastures should be clipped at intervals during the summer to maintain the quality of the forage and to control weeds.

Capability unit VIw-6

In this unit is a miscellaneous land type that is made up of a mixture of deep, poorly and very poorly drained soils on bottom lands. Relief is nearly level, and internal drainage and surface runoff are slow. The areas are often flooded early in spring. The land type in this unit is—

Mixed alluvial land.

The areas of Mixed alluvial land are suitable for pasture, but most of them are very narrow bands adjacent to small streams and are forested.

Pastures should be seeded to moisture-tolerant grasses and legumes. Frequent, but moderate, applications of lime and fertilizer are needed. Grazing should be regulated so as to maintain a good sod.

Trees do not grow rapidly on Mixed alluvial land. Larch, cedar, and willow are predominant.

Capability unit VIs-1

This unit consists of rolling, very rocky and shaly soils that are shallow to bedrock. The soils are on glacial till. They have medium internal drainage and medium to rapid surface runoff. Relief is gently sloping or moderately sloping. Numerous outcrops of shale bedrock are exposed between the deeper soils. The soils in this unit are—

Mapleton very rocky silt loam, 0 to 15 percent slopes.
Thorndike very rocky silt loam, 0 to 8 percent slopes.
Thorndike very rocky silt loam, 8 to 15 percent slopes.

These soils are suitable for pasture. Only small areas have been cleared, however, and it is generally more economical to use the soils mainly for forestry. When used for pasture, the soils should be seeded to grasses and legumes. They need fertilizer and lime for the maintenance of fertility.

The soils produce almost pure stands of northern hardwoods. These trees grow slowly, but through proper management, the woodlands are easily converted to the faster growing softwoods. Selective cutting should be done to encourage the more valuable trees.

Capability unit VIs-3

Well drained and moderately well drained, very stony soils on glacial till in the uplands are in this unit. These soils are gently sloping and moderately steep and have medium to moderately slow internal drainage and medium to rapid surface runoff. Most of them are deep, but the Thorndike soils are moderately shallow. The soils in this unit are—

Howland very stony loam, 0 to 8 percent slopes.
Howland very stony loam, 8 to 15 percent slopes.
Plaisted very stony loam, 0 to 8 percent slopes.
Plaisted very stony loam, 8 to 15 percent slopes.
Plaisted very stony loam, 15 to 25 percent slopes.
Plaisted and Howland very stony loams, 0 to 8 percent slopes.
Plaisted and Howland very stony loams, 8 to 15 percent slopes.
Thorndike and Howland soils, 0 to 8 percent slopes.
Thorndike and Howland soils, 8 to 15 percent slopes.

Nearly all the acreage of these soils is forested. Some areas can be cleared of trees and stones and seeded to grasses and legumes for pasture. Applications of lime and fertilizer are needed at the time of seeding; good yields of forage can be maintained by frequent applications. Pastures should be clipped or sprayed to control weeds.

These soils produce good stands of mixed northern hardwoods, spruce, and fir. Selective cutting should be done to encourage the more valuable trees.

Capability unit VIIes-5

This unit consists of a somewhat excessively drained soil on terrace faces, steep sides of eskers, and glacial outwash. This soil is hilly, and it has rapid surface runoff, rapid permeability, and low water-holding capacity. The texture is generally gravelly loamy sand below a depth of 12 inches. The soil in this unit is—

Colton gravelly sandy loam, dark materials, 25 to 45 percent slopes.

This soil is in forests of pine, fir, and hardwoods. It is too steep and droughty for more intensive use.

Capability unit VIIw-9

This unit is made up of poorly drained organic soils. These soils are generally shallow and consist of partly decayed plant material. They are covered with water for more than 6 months of the year. The soils in this unit are—

Peat and muck.

These organic soils are forested mostly with spruce and cedar. The trees grow slowly, and little can be done to increase the rate of growth or to change the species of trees. Tree planting or artificial drainage are not suggested for these soils. Woodland operations are usually done during the winter when the soils are frozen.

Capability unit VIIs-1

This unit is made up of rolling to steep, very rocky and shaly soils on glacial till in the uplands. These soils are shallow to bedrock and are droughty during short, dry periods. Internal drainage is medium, and surface runoff is rapid. Many outcrops of shale bedrock occur between the deeper soils. The soils in this unit are—

Mapleton very rocky silt loam, 15 to 35 percent slopes.
Thorndike shaly silt loam, 25 to 45 percent slopes.
Thorndike very rocky silt loam, 15 to 25 percent slopes.
Thorndike very rocky silt loam, 25 to 45 percent slopes.

These soils are used mainly for forestry. They produce mostly northern hardwoods, but spruce grows on some of the steeper northwestern slopes. The trees grow slowly, however. Selective cutting should be done to encourage the more desirable trees. Because of exposed bedrock and steep slopes, logging is difficult on these soils. Logging roads should be designed to avoid the large rock outcrops and the exposure of steep slopes to erosion.

Capability unit VIIs-3

In this unit is a deep, well-drained, very stony soil on glacial till in the uplands. Internal drainage is medium, and surface runoff is rapid. The soil in this unit is—

Plaisted very stony loam, 25 to 45 percent slopes.

This soil is used for forestry. It is too steep and stony to be used for hay or pasture. Hardwoods grow well on this soil. Spruce, fir, and northern hardwoods grow on some of the steeper northwestern slopes. In general, selective cutting should be done to encourage the more desirable hardwoods. Logging is difficult on the steeper slopes. Logging roads should be built on the contour to avoid washouts and loss of soil.

Capability unit VIIsw-3

This unit consists of deep, poorly and very poorly drained, very stony soils on glacial till. Relief is level to gently sloping, and internal drainage and surface runoff are slow. The soils in this unit are—

Monarda and Burnham very stony silt loams, 0 to 8 percent slopes.

These soils are used for forestry. They produce mostly spruce and fir, but the trees grow slowly. Some nearly level areas have thin stands of slow-growing black spruce. Logging is usually done when the soils are frozen.

Estimated Yields

Table 1 gives estimated average acre yields of principal crops grown on the soils of Southern Aroostook County under two levels of management. Estimated yields for all the soils, except the steep, stony, or rocky ones and the organic soils, are listed in the table.

In columns A of table 1 are yields obtained under fair management. Farmers who obtain these yields use certified seed; keep weeds from smothering crops; keep insects and diseases from destroying crops; and use adequate amounts of fertilizer for the level of management practiced. Under the A level of management, however, the degree of drainage on wet soils, the control of surface runoff on sloping soils, and the conservation of water on droughty soils are not applied to the extent suggested by the Maine Agricultural Experiment Station and the Soil Conservation Service.

In columns B of table 1 are yields obtained under good or improved management. Under this level of management, farmers use certified seed; plant varieties of crops suited to the soils; control weeds, diseases, and insects; and apply adequate amounts of fertilizer and lime. In addition to these practices, farmers use artificial drainage to remove excess moisture from wet soils, and they control surface runoff on sloping soils. At present soils used for potatoes receive about 120 to 160 pounds of nitrogen (N), 200 pounds of phosphate (P_2O_5), and 200 pounds of potash (K_2O) per acre.

Estimated yields for Southern Aroostook County are somewhat lower than those given in the published report of Aroostook County, Maine: Northeastern Part. Nearly all the cleared acreage in the northeastern part of Arrostook County has been planted to potatoes for many years, and the soils have been heavily fertilized. The soils in the southern part of Aroostook County, however, have not been used so intensively or fertilized so heavily. Thus, the estimated yields for the northeastern part of Aroostook County are generally higher under good management (columns B), probably because of the beneficial effect obtained from continued heavy applications of fertilizer and not necessarily because of differences in the natural qualities of the soils.

TABLE 1.—*Estimated average acre yields of crops grown on the soils under two levels of management*

[Average yields in columns A are to be expected under fair management; yields in columns B are to be expected under improved management. Absence of a yield figure indicates the soil is not commonly used for the specified crop. No estimated yields are given for steep, stony, or rocky soils and organic soils]

Soils	Potatoes		Oats		Hay		Pasture	
	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre days* [1]	*Cow-acre days* [1]
Caribou gravelly loam, 0 to 2 percent slopes	470	490	70	80	2. 5	3. 0	160	210
Caribou gravelly loam, 2 to 8 percent slopes	450	470	70	80	2. 5	3. 0	160	210
Caribou gravelly loam, 8 to 15 percent slopes	400	450	60	80	2. 5	3. 0	150	210
Caribou gravelly loam, 15 to 25 percent slopes	--	--	--	--	2. 0	2. 5	100	150
Caribou gravelly loam, 25 to 45 percent slopes	--	--	--	--	--	--	90	120
Colton gravelly sandy loam, dark materials, 0 to 2 percent slopes	300	400	60	70	2. 0	2. 5	90	120
Colton gravelly sandy loam, dark materials, 2 to 8 percent slopes	275	400	60	70	2. 0	2. 5	90	120
Colton gravelly sandy loam, dark materials, 8 to 15 percent slopes	250	350	50	60	1. 5	2. 0	80	120
Colton gravelly sandy loam, dark materials, 15 to 25 percent slopes	--	--	--	--	1. 0	2. 0	60	100
Conant silt loam, 0 to 2 percent slopes	350	425	60	70	2. 5	3. 0	160	210
Conant silt loam, 2 to 8 percent slopes	350	425	60	70	2. 5	3. 0	160	210
Conant silt loam, 8 to 15 percent slopes	350	400	60	70	2. 5	3. 0	160	210
Daigle silt loam, 0 to 2 percent slopes	275	350	55	70	2. 5	3. 0	150	210
Daigle silt loam, 2 to 8 percent slopes	275	350	55	70	2. 5	3. 0	150	210
Daigle silt loam, 8 to 15 percent slopes	275	350	55	70	2. 5	3. 0	150	210
Hadley silt loam	300	450	60	70	2. 5	3. 0	160	210
Howland gravelly loam, 0 to 2 percent slopes	350	400	50	60	2. 5	3. 0	150	210
Howland gravelly loam, 2 to 8 percent slopes	350	400	50	60	2. 5	3. 0	150	210
Howland gravelly loam, 8 to 15 percent slopes	350	390	50	60	2. 5	3. 0	150	210
Linneus silt loam, 0 to 8 percent slopes	425	470	70	80	2. 5	3. 0	160	210
Linneus silt loam, 8 to 15 percent slopes	375	450	60	70	2. 5	3. 0	160	210
Linneus silt loam, 15 to 35 percent slopes	--	--	--	--	1. 5	2. 5	100	150
Machias gravelly loam, 0 to 2 percent slopes	350	425	60	70	2. 0	3. 0	150	200
Machias gravelly loam, 2 to 8 percent slopes	350	425	60	70	2. 0	3. 0	150	200
Machias gravelly loam, 8 to 15 percent slopes	--	--	--	--	2. 0	3. 0	150	200
Mapleton shaly silt loam, 0 to 8 percent slopes	400	450	60	80	2. 5	3. 0	160	210
Mapleton shaly silt loam, 8 to 15 percent slopes	350	400	55	70	2. 0	3. 0	160	210
Mapleton shaly silt loam, 15 to 35 percent slopes	--	--	--	--	1. 5	2. 5	100	150
Monarda and Burnham silt loams, 0 to 2 percent slopes	--	--	--	--	2. 0	3. 0	90	150
Monarda and Burnham silt loams, 2 to 8 percent slopes	--	--	--	--	2. 0	3. 0	90	150
Perham gravelly silt loam, 0 to 2 percent slopes	400	450	60	70	2. 5	3. 0	160	210
Perham gravelly silt loam, 2 to 8 percent slopes	400	450	60	70	2. 5	3. 0	160	210
Perham gravelly silt loam, 8 to 15 percent slopes	375	425	60	70	2. 5	3. 0	150	210
Perham gravelly silt loam, 15 to 25 percent slopes	--	--	--	--	2. 0	2. 5	100	150
Plaisted gravelly loam, 0 to 8 percent slopes	400	450	60	70	2. 5	3. 0	160	210
Plaisted gravelly loam, 8 to 15 percent slopes	375	425	60	70	2. 5	3. 0	150	210
Plaisted gravelly loam, 15 to 25 percent slopes	--	--	--	--	2. 0	2. 5	100	150
Red Hook and Atherton silt loams, 0 to 2 percent slopes	--	--	--	--	2. 0	3. 0	90	150
Red Hook and Atherton silt loams, 2 to 8 percent slopes	--	--	--	--	2. 0	3. 0	90	150
Stetson gravelly loam, 0 to 2 percent slopes	450	490	70	80	2. 5	3. 0	160	210
Stetson gravelly loam, 2 to 8 percent slopes	410	470	70	80	2. 5	3. 0	160	210
Thorndike shaly silt loam, 0 to 8 percent slopes	350	425	60	70	2. 5	3. 0	90	150
Thorndike shaly silt loam, 8 to 15 percent slopes	300	400	55	70	2. 0	3. 0	90	150
Thorndike shaly silt loam, 15 to 25 percent slopes	--	--	--	--	1. 5	2. 5	80	120
Thorndike shaly silt loam, 25 to 45 percent slopes	--	--	--	--	--	--	60	90
Winooski silt loam	300	400	50	60	2. 5	3. 0	160	210

[1] The term "cow-acre-days" is used to express the carrying capacity or grazing value of pasture. It equals the number of days of grazing that 1 acre will provide one animal unit in a year without injury to the sod. One animal unit is a mature cow, steer, or horse, or five mature sheep.

Forestry [1]

Trees were the native vegetation of Southern Aroostook County, and they still are predominant. Forest trees grow on about two-thirds of the 993,348 acres of land in the survey area. Some land that was once cleared for crops has reverted to forests. Most of the acreage is made up of soils that are too wet, steep, or shallow to produce profitable yields of crops. If reforested to suitable species of trees, such soils will become more valuable.

The forests of Southern Aroostook County provide year-round employment for many people and part-time employment for local farmers.

[1] This section was prepared by ALLEN R. GRAY, woodland conservationist, Soil Conservation Service.

Forest Species

Northern hardwoods—beech, birch, and maple—and a few red spruce and pine grow on the well-drained soils. The original forests probably contained more spruce and pine than the present forests. Spruce is persistent in this climatic zone and grows rapidly on well-drained soils. Northern hardwoods, however, suppress spruce trees on the well-drained ridges, so spruce predominates only on the less well-drained sites.

Mixed stands of softwoods and hardwoods grow on the moderately well drained and somewhat poorly drained soils. Spruce and fir are the predominant softwoods, but the stands contain clumps of pine and larch. White pine probably was more common on the moderately well drained soils, especially the sandy ones, but very little pine seeded naturally after the original trees were cut.

The poorly and very poorly drained soils produce mostly spruce and fir. A few larch, pine, maple, and birch trees are mixed with the spruce. Red spruce predominates on poorly drained soils because northern hardwoods are not adapted and, therefore, offer no competition. Red spruce does not grow rapidly, however.

Woodland Suitability Groups

The soils of Southern Aroostook County (except Made land) have been placed in six woodland suitability groups to assist owners in planning the use of their woodland. Each group contains soils that have similar physical characteristics, produce similar trees, and respond to similar management practices. Table 2 gives, for each suitability group, the potential productivity for white pine, red spruce, and northern hardwoods; the relative severity of some of the limitations on timber production; and ratings for road material. The productivity ratings are estimates based on data collected in Maine and New Hampshire for similar soils. Other ratings in table 2 are based on the judgment of foresters, soil scientists, and others familiar with the survey area.

The text first explains the column headings used in table 2 and the ratings given for suitability groups. It also discusses briefly additional factors that affect the growing of trees. Then, for each woodland suitability group, it lists the soils and gives a brief statement about their management.

1. *Potential productivity for white pine, red spruce, and northern hardwoods.* In these columns ratings of *very good*, *good*, *fair*, and *poor* are assigned for woodland suitability groups.
2. *Equipment limitations (also known as trafficability).* These limitations refer to soil characteristics and topographic features that restrict or prohibit the use of equipment commonly used in the tending and harvesting of trees. A knowledge of these factors is helpful in determining the kinds of equipment to use, the methods of operating the equipment, and the seasons in which equipment can be used on different groups of soils. Ratings for equipment limitations, as well as those for seedling mortality and windthrow hazard, are given in terms of *slight*, *moderate*, and *severe*.
3. *Seedling mortality.* This refers to the expected degree of mortality of natural seedlings on soils of different suitability groups.
4. *Windthrow hazard.* This refers to wind firmness, as reflected by soil characteristics that control the development of root systems of trees.

TABLE 2.—*Woodland suitability groups, potential productivity for trees, and limitations*

Woodland suitability groups and map symbols	Potential productivity for—			Equipment limitations	Seedling mortality	Windthrow hazard	Road material
	White pine	Red spruce	Northern hardwoods				
Group 1: Well-drained, medium-textured soils (CgA, CgB, CgC, CgD, CgE, Ha, PeA, PeB, PeC, PeD, PgB, PgC, PgD, PrB, PrC, PrD, PrE, PvB, PvC).	Very good	Good	Good	Slight to severe.	Slight	Slight	Fair.
Group 2: Moderately well drained, medium-textured soils (CoA, CoB, CoC, DaA, DaB, DaC, HoA, HoB, HoC, HvB, HvC, MaA, MaB, MaC, Wn).	Very good	Very good	Good	Moderate	Slight	Moderate	Fair.
Group 3: Well-drained and somewhat excessively drained, dominantly gravelly sandy loams (CnA, CnB, CnC, CnD, CnE, SgA, SgB).	Good	Good	Good	Slight to severe.	Slight	Slight	Good.
Group 4: Well-drained, dominantly shallow, shaly or very rocky soils (LnB, LnC, LnD, MhB, MhC, MhD, MmC, MmD, ThB, ThC, ThD, ThE, TkB, TkC, TkD, TkE, TsB, TsC).	Good	Good	Good	Slight to severe.	Slight	Moderate	Fair.
Group 5: Poorly and very poorly drained, medium-textured soils (Mn, MoA, MoB, MrB, RaA, RaB).	Good	Fair	Poor	Severe	Moderate	Severe	Poor.
Group 6: Peat and muck (Pa)	Poor	Poor	Poor	Severe	Severe	Severe	Poor.

5. *Road material.* This refers to the suitability of the soils of different groups as sources of surfacing material for roads in wooded areas. Ratings are given in terms of *good*, *fair*, and *poor*.

The effects of aspect, position on slope, elevation, insects, and disease were not rated for the woodland suitability groups because not enough information concerning these items is available for the different kinds of soils in Southern Aroostook County. In woodlands the hazard of erosion is fairly slight, except where roads are constructed on steep slopes.

Numerous outcrops and large boulders may severely hamper logging, except during winter when snow is deep. This problem may be encountered on the Thorndike very rocky silt loams.

On slopes of less than 15 percent, there is little difficulty in logging or in the building of roads by either farmers or commercial operators. On slopes of 15 to 25 percent, commercial operators have few problems in logging or in building roads, but farmers will have some difficulty. On slopes of 25 to 45 percent, there is a serious problem in logging and in the building of roads. Also, on such slopes, erosion makes it difficult to maintain the roads.

Woodland suitability group 1

This group consists of well-drained, medium-textured soils that are more than 2 feet deep to material that limits the penetration of roots. The soils in this group are—

Caribou gravelly loam, 0 to 2 percent slopes.
Caribou gravelly loam, 2 to 8 percent slopes.
Caribou gravelly loam, 8 to 15 percent slopes.
Caribou gravelly loam, 15 to 25 percent slopes.
Caribou gravelly loam, 25 to 45 percent slopes.
Hadley silt loam.
Perham gravelly silt loam, 0 to 2 percent slopes.
Perham gravelly silt loam, 2 to 8 percent slopes.
Perham gravelly silt loam, 8 to 15 percent slopes.
Perham gravelly silt loam, 15 to 25 percent slopes.
Plaisted gravelly loam, 0 to 8 percent slopes.
Plaisted gravelly loam, 8 to 15 percent slopes.
Plaisted gravelly loam, 15 to 25 percent slopes.
Plaisted very stony loam, 0 to 8 percent slopes.
Plaisted very stony loam, 8 to 15 percent slopes.
Plaisted very stony loam, 15 to 25 percent slopes.
Plaisted very stony loam, 25 to 45 percent slopes.
Plaisted and Howland very stony loams, 0 to 8 percent slopes.
Plaisted and Howland very stony loams, 8 to 15 percent slopes.

All soils in this group, except the Hadley, are on till ridges in the uplands, where the trees are mainly birch, beech, and maple. The Hadley soil is on flood plains, where the common trees are mixed conifers and northern hardwoods.

The undifferentiated units made up of Plaisted and Howland very stony loams are included in group 1. The areas that consist mainly of Plaisted very stony loams have the same ratings, in table 2, as the other soils of group 1, but the areas that consist mainly of Howland very stony loams have the same ratings as the soils of group 2.

Woodland suitability group 2

This group consists of dominantly moderately well drained, medium-textured soils. These soils have a layer that limits root penetration to a depth of less than 2 feet or have a water table that fluctuates to within 2 feet of the surface. The soils in this group are—

Conant silt loam, 0 to 2 percent slopes.
Conant silt loam, 2 to 8 percent slopes.
Conant silt loam, 8 to 15 percent slopes.
Daigle silt loam, 0 to 2 percent slopes.
Daigle silt loam, 2 to 8 percent slopes.
Daigle silt loam, 8 to 15 percent slopes.
Howland gravelly loam, 0 to 2 percent slopes.
Howland gravelly loam, 2 to 8 percent slopes.
Howland gravelly loam, 8 to 15 percent slopes.
Howland very stony loam, 0 to 8 percent slopes.
Howland very stony loam, 8 to 15 percent slopes.
Machias gravelly loam, 0 to 2 percent slopes.
Machias gravelly loam, 2 to 8 percent slopes.
Machias gravelly loam, 8 to 15 percent slopes.
Winooski silt loam.

All the soils, except the Machias and Winooski, are on sloping till ridges in the uplands. The Machias soils are on terraces or glacial outwash and are underlain by gravel at a depth of about 30 inches. The Winooski soil is on flood plains.

On the soils of group 2, there are mainly mixed stands of birch, beech, maple, spruce, fir, and pine.

Woodland suitability group 3

This group consists of well drained and somewhat excessively drained gravelly sandy loams and gravelly loams. These soils are mainly on eskers and terraces. Layers of gravel are generally within 18 inches of the surface. The soils in this group are—

Colton gravelly sandy loam, dark materials, 0 to 2 percent slopes.
Colton gravelly sandy loam, dark materials, 2 to 8 percent slopes.
Colton gravelly sandy loam, dark materials, 8 to 15 percent slopes.
Colton gravelly sandy loam, dark materials, 15 to 25 percent slopes.
Colton gravelly sandy loam, dark materials, 25 to 45 percent slopes.
Stetson gravelly loam, 0 to 2 percent slopes.
Stetson gravelly loam, 2 to 8 percent slopes.

White pine is common on these soils. The forests, however, generally consist of both conifers and northern hardwoods.

Woodland suitability group 4

This group is made up of well-drained soils on irregular, strongly rolling ridges of glacial till. Shallowness to bedrock limits penetration of roots and storage of moisture to a depth of less than 2 feet. Rock outcrops are common. The soils in this group are—

Linneus silt loam, 0 to 8 percent slopes.
Linneus silt loam, 8 to 15 percent slopes.
Linneus silt loam, 15 to 35 percent slopes.
Mapleton shaly silt loam, 0 to 8 percent slopes.
Mapleton shaly silt loam, 8 to 15 percent slopes.
Mapleton shaly silt loam, 15 to 35 percent slopes.
Mapleton very rocky silt loam, 0 to 15 percent slopes.
Mapleton very rocky silt loam, 15 to 35 percent slopes.
Thorndike shaly silt loam, 0 to 8 percent slopes.
Thorndike shaly silt loam, 8 to 15 percent slopes.
Thorndike shaly silt loam, 15 to 25 percent slopes.
Thorndike shaly silt loam, 25 to 45 percent slopes.
Thorndike very rocky silt loam, 0 to 8 percent slopes.
Thorndike very rocky silt loam, 8 to 15 percent slopes.
Thorndike very rocky silt loam, 15 to 25 percent slopes.
Thorndike very rocky silt loam, 25 to 45 percent slopes.
Thorndike and Howland soils, 0 to 8 percent slopes.
Thorndike and Howland soils, 8 to 15 percent slopes.

Where bedrock is near the surface, the potential productivity for all the trees listed in table 2 is fair instead of good. The common trees on all soils in this group are birch, beech, and maple.

Undifferentiated units made up of Thorndike and Howland soils are included in group 4. The areas that consist mainly of the Thorndike soils have the same ratings in table 2, as the other soils of group 4, but the areas that consist mainly of the Howland soils have the same ratings as the soils of group 2.

Woodland suitability group 5

This is a group of poorly and very poorly drained, medium-textured soils that are mainly in depressions or flats. A water-saturated horizon limits penetration of roots to a depth of less than 13 inches. The soils in this group are—

Mixed alluvial land.
Monarda and Burnham silt loams, 0 to 2 percent slopes.
Monarda and Burnham silt loams, 2 to 8 percent slopes.
Monarda and Burnham very stony silt loams, 0 to 8 percent slopes.
Red Hook and Atherton silt loams, 0 to 2 percent slopes.
Red Hook and Atherton silt loams, 2 to 8 percent slopes.

In areas saturated to the surface most of the year, the potential productivity for all trees is poor. The common trees are spruce and fir.

Woodland suitability group 6

This group is made up of very poorly drained organic soils in bogs. Except during severe droughts, the soils are saturated to the surface. The only soils in this group are—

Peat and muck.

Most areas of peat and muck are covered by noncommercial forest and are poorly suited to productive trees, such as white pine, red spruce, and northern hardwoods. Cedar, however, grows in some of the bogs and can be used for fenceposts.

Wildlife

The use of the soils of Southern Aroostook County for wildlife purposes is discussed in two main parts. In the first the food, cover, and kinds of wildlife in the general soil areas (soil associations) are explained. (See the section "General Soil Map" in the front of the report and the general map in the back.) In the second part, the suitability of the soils for specific kinds of wildlife habitats is discussed.

General Soil Areas and Wildlife

Following is a brief description of the general soil areas, the kinds of plants in the areas, and the suitability of the areas for deer, snowshoe hare, ruffed grouse, and waterfowl.

Trout fishing is done in streams in all the general soil areas, and in general, fishing is good. Nevertheless, the streams in the eastern part of Southern Aroostook County have become somewhat polluted, and fishing is not so good in these streams as in the less accessible streams in the western part.

Area 1

This area is made up mainly of Caribou, Mapleton, Linneus, and Conant soils on gently rolling ridges of glacial till in the uplands. A few rocky and steep soils are in area 1. The soils of area 1 are fairly high in lime and, in general, are well drained.

About 75 percent of the acreage is used for cultivated crops and pasture, and about 25 percent, for woodland. The woodlands consists mainly of birch, beech, and maple and a few white pine, spruce, and fir. Many of the pastures are made up of native grasses, and about 10 percent of the pastured area is covered with small trees, shrubs, and weeds. In any one year, nearly 30 percent of the acreage used for crops has a stand consisting of mixed grasses and clovers.

Deer.—In this area many fields of clovers and grasses provide excellent grazing for deer from spring until late in fall. These fields are fairly fertile, and this may tend to increase the reproductive capacity and size of the deer. In small areas of brushland, deer feed on the buds and twigs during most of the year. In winter little food is available, and there are few areas with dense cover that will protect deer from winds and drifting snow.

Snowshoe hare.—A few abandoned fields and pastures provide excellent year-round feeding areas for the snowshoe hare. In winter snowshoe hare obtain additional browsing from young northern hardwoods. Conifers are used by the hare for cover.

Ruffed grouse.—Because of intensive farming in area 1, ruffed grouse have few feeding areas or areas with a dense cover. Grouse feed on clovers along fields near areas with a dense cover.

Waterfowl.—The soils in this group are not suitable as impoundments for waterfowl. There are no natural wet lands.

Areas 2 and 3

These two areas consist mainly of the sloping and hilly Thorndike, Plaisted, Perham, Howland, and Daigle soils. The soils are dominantly well drained and moderately well drained. Small areas of rocky and steep soils are included in areas 2 and 3.

About 20 percent of the land has been cleared of trees and stones and is used for potatoes, oats, hay, and pasture. In any one year, about 60 percent of the cleared acreage is in grasses and clovers. Some additional land was once cleared but now has a cover of hardwood brush and young conifers.

Gray birch, alder, and willow are the principal hardwoods, and fir, spruce, and pine are the main conifers. Most of the rest of the land in forests has a cover of spruce, fir, cedar, northern hardwoods, and pine.

Deer.—Hay, pasture, and abandoned fields furnish excellent feed for deer from early in spring to early in winter. Brushland occurs throughout the areas, and deer feed on the buds and twigs, especially after snow falls.

Small areas with a dense cover of spruce and fir can be used for winter yards, but these offer few well-protected places that provide abundant winter feed. Since deer can find excellent places for winter yards on the nearly level, wet soils in area 5, many of them move to this area before deep, drifting snow limits their movement.

Snowshoe hare.—Abandoned fields and pastures are excellent year-round feeding places for the snowshoe hare. The surrounding forests of mixed conifers and northern

hardwoods are used for cover. In summer the borders of hayfields provide plenty of grazing and cover. Shrubs and grasses grow in some logging roads and furnish food for snowshoe hare. The many small fir trees along road-banks provide excellent cover.

Ruffed grouse.—Forests of northern hardwoods are used by the ruffed grouse for nesting and brood rearing. Scattered hardwood shrubs and fruit-bearing bushes in abandoned fields, in pastures, and along field borders provide an excellent source of buds and berries from spring until late in fall. During winter ruffed grouse find cover and food in spruce, fir, and cedar trees that occur in mixed stands of conifers and hardwoods. In some places, however, there is enough food for only a few birds. In places that have been logged in the last few years there are many open areas that have an understory of small aspen, birch, and willow shrubs. Ruffed grouse eat the buds of these shrubs during winter.

Waterfowl.—Because of the lack of natural wet lands and proper locations for shallow impoundments, general soil areas 2 and 3 are unsuitable for waterfowl.

Area 4

This general soil area consists of sandy and gravelly deposits on eskers and terraces and of recent stream deposits consisting of silt and fine sand. The dominant soils on the eskers and terraces are the well-drained Colton, the moderately well drained Machias, and the poorly to very poorly drained Red Hook and Atherton. The recent stream deposits occur as narrow bottom lands adjacent to streams. The dominant soils on the bottom lands are the well-drained Hadley, the moderately well drained Winooski, and the poorly to very poorly drained Mixed alluvial land.

About 20 percent of the land has been cleared and is used for cultivated crops and pasture. The rest produces mainly a mixed stand of pine, northern hardwoods, and a few spruce, fir, alder, and cedar. In cutover forests, aspen and birch are common.

Deer.—Grazing and yarding areas for deer are along the bottom lands. In summer, deer obtain a limited amount of grazing in culivated fields and pastures. Areas to the south of the eskers provide good shelters; alder, white-cedar, and shrubs furnish some food during the entire year. In winter many deer move from the other general areas to this area. Except during severe winters, when the level bottom lands may be overstocked, area 4 provides adequate food and cover for many deer.

Snowshoe hare.—Snowshoe hare graze from spring until late summer in fields and pastures. Cedar and alder swamps along the bottom lands provide year-round food and cover. Some pine, fir, and brush hardwoods along the sides of eskers and terraces also furnish food and cover during the entire year.

Ruffed grouse.—Areas of hardwood trees on eskers are nesting places for ruffed grouse, and white pine provide winter cover. The mixed growth of spruce, fir, swamp maple, alder, white-cedar, and shrubs on the bottom lands is used the year round for food and cover.

Waterfowl.—The wetter areas of Mixed alluvial land and the Red Hook and Atherton soils have some small natural marshes that attract waterfowl. In some places shallow impoundments that would benefit waterfowl can be constructed.

Area 5

In area 5 are nearly level, poorly and very poorly drained Monarda and Burnham soils and scattered areas of Peat and muck. Less than 5 percent of the acreage has been cleared of trees and used for hay and pasture. The rest is still in forests of white spruce, black spruce, balsam fir, larch, cedar, swamp maple, and a few white pines. The understory is mainly alder, willow, gray birch, ferns rushes, and sedges.

Deer.—Thick stands of spruce and fir provide excellent winter yards and protect deer from strong winds and drifting snow. During most of the year, food is available within the area. Sedges and rushes furnish some grazing in fall and early in winter. Snow seldom limits the movement of deer early in winter. By midwinter, low-growing vegetation is covered with snow. Cedar and alder thickets, however, furnish excellent browsing until late in winter. At that time deep snow confines deer close to their winter yards. This limits their supply of food, but usually a small supply of buds and twigs from gray birch, maple, willow, and alder provide a survival diet. As the snow melts early in spring, the deer move to new browsing sites within the area. Late in spring sedges and rushes are again available for grazing. In spring and summer additional grazing is available in the hayfields and pastures.

Snowshoe hare.—Snowshoe hare use the thick woodlands of spruce and fir for year-round food and cover. The understory provides excellent browsing during winter, but deer and snowshoe hare compete for the food. Sedges and rushes provide some grazing in spring and summer. In summer snowshoe hare find additional grazing in the hayfields and pastures. Brush-type pastures and field borders furnish both cover and food.

Ruffed grouse.—The stands of spruce and fir provide winter cover for ruffed grouse, and the understory furnishes some buds and seeds for food. Open areas along logging roads often contain weeds and fruiting shrubs that furnish seeds and fruit for grouse during fall and early in winter. Weeds, seeds, and the fruit of shrubs along the edges of some pastures and hayfields provide excellent food during summer and fall. The border between the soils of general area 5 and the gently rolling upland soils of area 1 furnishes good sites for cover and feeding.

Waterfowl.—Most of the natural wet lands suitable for waterfowl are on the Monarda and Burnham soils. There are good locations for establishing shallow impoundments on these soils.

Suitability of the Soils for Wildlife

Ratings on the suitability of the soils of Southern Aroostook County for the establishment, development, and maintenance of specific kinds of wildlife habitats are given in table 3. The general suitability of the soils for woodland and wetland wildlife is also shown in this table.

In the text that follows, the various kinds of habitats and the kinds of wildlife are described and the suitability ratings used in table 3 are defined.

Habitats:

Grasses and legumes.—Domestic perennial grasses and herbaceous legumes that are planted to furnish cover and food for wildlife. Examples: Fescues, bromegrass, bluegrasses, timothy, redtop, orchardgrass, reed canarygrass, clovers, trefoils, and alfalfa.

Wild herbaceous upland plants.—Native or introduced perennial grasses and forbs (weeds) that provide food and cover principally to wildlife in the uplands and are established mainly through natural processes. Examples: Indiangrass, wheatgrasses, wildrye, oatgrasses, strawberries, beggarweeds, wildbeans, nightshades, goldenrod, and dandelion.

Hardwood woodland plants.—Nonconiferous trees, shrubs, and woody vines that produce fruits, nuts, buds, catkins, twigs, or foliage that are used extensively for food by wildlife and that commonly are established through natural processes but also can be planted. Examples: Oaks, beech, cherries, hawthorns, dogwoods, viburnums, hollies, maples, birches, poplars, blueberries, briers, and roses.

Coniferous woodland plants.—Cone-bearing trees and shrubs. These plants are primarily important to wildlife as cover, but they also furnish food in the form of browse, seeds, or fruitlike cones; they are commonly established through natural processes but also can be planted. Examples: Pines, spruces, white-cedar, hemlock, balsam fir, redcedar, junipers, and yews.

Wetland food and cover plants.—Annual and perennial wild herbaceous plants (exclusive of submerged or floating aquatics) in damp to wet sites. The food or cover is used mainly by wetland kinds of wildlife. Examples of plants: Smartweeds, wild millets, bulrushes, spikesedges, rushes, sedges, burreeds, reeds, wildrice, rice cutgrass, switchgrass, mannagrasses, bluejoint, and cattails.

Shallow water developments.—Impoundments, excavated areas, and structures to control the water level at a depth generally not exceeding 5 feet. Examples: Low dikes and levees, shallow dugouts, level ditches, and devices for the control of the water level in marshy areas.

Excavated ponds.—Dugout areas that have water of suitable quality, of suitable depth, and of ample supply for fish or wildlife. In determining the suitability of the soils for excavated ponds (see table 3), the watershed sources of the pond water were not considered. Example: A pond that has at least one-tenth acre of surface area and has an average depth of 6 feet over at least one-fourth of the surface area; it has a dependably high water table or another source of unpolluted water of low acidity.

The suitability of sites for impounded ponds may be governed by the depth of the soil over bedrock or coarse material, the kind of soil material for embankments, the ability of the underlying material to hold water, the sources of water, the slope of the site, and the hazard of flooding. Because of these different factors, no specific ratings are given for impounded ponds in table 3.

Kinds of wildlife:

Woodland wildlife.—Birds and mammals that normally frequent wooded areas of hardwood trees and shrubs, coniferous trees and shrubs, or mixtures of such plants.

Wetland wildlife.—Birds and mammals that normally frequent ponds, marshes, and swamps.

Suitability ratings of soils for wildlife habitats:

1. *Well suited.*—This rating, as shown in table 3, indicates that habitats generally can be easily established, developed, and maintained on the soils. There are few limitations in the installation of habitats and satisfactory results are well assured.
2. *Suitable.*—This rating indicates that the soils are slightly to moderately limited in their suitability for the establishment, development, and maintenance of habitats. Because of these limitations, the habitats need to be managed more intensively than those on soils that are rated "well suited," and the success of the habitats is not so well assured.
3. *Poorly suited.*—This rating indicates that the soils are severely limited in their suitability for the establishment, development, and maintenance of habitats. The habitats may be difficult to manage, and satisfactory results are not well assured.
4. *Unsuited.*—This rating indicates that habitats cannot be established, developed, and maintained on the soils, or that it is generally impractical to attempt to use the soils for habitats. It is highly doubtful that satisfactory habitats could be obtained.

Engineering Applications [2]

This soil survey report has considerable value for uses other than agriculture. Among these is its use by engineers in making plans for highways, dams, levees, canals, ditches, or other types of earthwork. *It is not intended, however, that this report will eliminate the need for sampling and testing for design and construction of specific engineering works.* The report can be used in eliminating tests on materials obviously unsuited for specific uses; in approximating design and construction needs; and in improving the location, design, and construction of low-hazard structures that normally are built on the basis of general experience with the soils in a given area.

Information in the report can also be used to—

1. Make soil and land use studies that will aid in selection and development of industrial, business, residential, and recreational sites.
2. Make preliminary estimates of the engineering properties of soils in the planning of agricultural drainage systems, farm ponds, irrigation systems, and diversion terraces.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting highway and airport locations and in planning detailed investigations of the selected locations.
4. Locate probable sources of gravel and other construction material.
5. Correlate performance of engineering structures with soil mapping units and thus develop information that will be useful in designing and maintaining the structures.
6. Determine the suitability of soil mapping units for cross-country movements of vehicles and construction equipment.

[2] RICHARD H. STONE, State conservation engineer, Soil Conservation Service, helped prepare this section.

TABLE 3.—*Suitability of the soils for wildlife*

[1 = well suited; 2 = suitable; 3 = poorly suited; 4 = unsuited]

Soil series and map symbols	Suitability for various wildlife habitats—							Suitability for—	
	Grasses and legumes	Wild herbaceous upland plants	Hardwood woodland plants	Coniferous woodland plants	Wetland food and cover plants	Shallow water developments	Excavated ponds	Woodland wildlife	Wetland wildlife
Caribou:									
CgA, CgB, CgC	1	1	1	3	4	4	4	2	4
CgD	2	1	1	3	4	4	4	2	4
CgE	3	2	2	2	4	4	4	2	4
Colton:									
CnA, CnB, CnC	2	2	1	2	4	4	4	1	4
CnD, CnE	3	3	3	2	4	4	4	2	4
Conant:									
CoA	1	1	1	3	3	3	3	2	3
CoB, CoC	1	1	1	3	4	4	4	2	4
Daigle:									
DaA	2	1	1	3	2	2	2	2	2
DaB	2	1	1	3	4	4	4	2	4
DaC	2	1	1	3	4	4	4	2	4
Hadley:									
Ha	1	1	1	2	4	4	4	2	4
Howland:									
HoA	1	1	1	3	3	3	3	2	3
HoB	1	1	1	3	4	4	4	2	4
HoC	1	1	1	3	4	4	4	2	4
HvB	3	1	1	2	4	4	4	1	4
HvC	3	1	1	2	4	4	4	1	4
Linneus:									
LnB, LnC, LnD	2	1	1	3	4	4	4	2	4
Machias:									
MaA	1	1	1	3	3	3	3	2	3
MaB, MaC	1	1	1	3	4	4	4	2	4
Made land:									
Md	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
Mapleton:									
MhB, MhC, MhD	2	1	1	3	4	4	4	2	4
MmC, MmD	3	3	2	2	4	4	4	2	4
Mixed alluvial land:									
Mn	3	3	1	1	1	4	3	1	2
Monarda and Burnham:									
MoA	3	2	1	2	1	1	1	2	1
MoB	3	2	1	2	4	4	4	2	4
MrB	3	2	1	2	4	4	4	1	4
Peat and muck:									
Pa	4	3	3	1	2	1	1	2	2
Perham:									
PeA	1	1	1	3	4	4	4	2	4
PeB	1	1	1	3	4	4	4	2	4
PeC	1	1	1	3	4	4	4	2	4
PeD	2	1	1	3	4	4	4	2	4

See footnotes at end of table.

TABLE 3.—*Suitability of the soils for wildlife*—Continued

Soil series and map symbols	Suitability for various wildlife habitats—							Suitability for—	
	Grasses and legumes	Wild herbaceous upland plants	Hardwood woodland plants	Coniferous woodland plants	Wetland food and cover plants	Shallow water developments	Excavated ponds	Woodland wildlife	Wetland wildlife
Plaisted:									
PgB, PgC	1	1	1	3	4	4	4	2	4
PgD	2	1	1	3	4	4	4	2	4
PrB, PrC	3	1	1	2	4	4	4	1	4
PrD, PrE	3	1	1	2	4	4	4	1	4
Plaisted and Howland:									
PvB, PvC	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Red Hook and Atherton:									
RaA	3	3	1	1	1	1	1	1	1
RaB	2	2	1	2	4	4	4	1	4
Stetson:									
SgA, SgB	1	1	1	3	4	4	4	2	4
Thorndike:									
ThB, ThC, ThD	2	1	1	3	4	4	4	2	4
ThE, TkB, TkC, TkD, TkE	3	3	2	2	4	4	4	2	4
Thorndike and Howland:									
TsB, TsC	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Winooski:									
Wn	1	1	1	3	3	4	3	2	4

[1] Variable.
[2] For specific areas, see ratings for Plaisted soils or for Howland soils.
[3] For specific areas, see ratings for Thorndike soils or for Howland soils.

7. Supplement information obtained from other published maps and reports and aerial photographs for the purpose of making maps and reports that can be used readily by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to a particular area.

Some of the terms used by the agricultural soil scientist may be unfamiliar to the engineer and some words—for example, soil, clay, silt, sand, and aggregate—may have special meanings in soil science. Such terms are defined in the Glossary in the back of this report.

The location of each soil in Southern Aroostook County is shown on the detailed soil map in the back of this report. Specific information about the properties of the soils are given in the sections "Descriptions of the Soils" and "Soil Formation and Classification." The soil profile descriptions, as well as the soil map, should be used in planning detailed surveys at construction sites. These will help the engineer concentrate on the most suitable soils, indicate sources of sand and gravel, and minimize the number of soil samples needed for laboratory testing.

Engineering Data and Interpretations

Engineering data and interpretations for the soils of Southern Aroostook County are described in tables 4 and 5. Brief descriptions and estimated physical properties of the soils are given in table 4. The estimates of physical properties are based on the interpretation of information about the soils given elsewhere in the report and on the results of laboratory tests performed on the same kinds of soils in other areas. The properties listed are those of profiles representative of each series. Physical properties of Made land vary considerably, so no estimates for this mapping unit are given in table 4.

In table 4 soil layers of a profile of each soil series are classified according to both the system of the American Association of State Highway Officials (AASHO) and the Unified system. Such soil tests as mechanical analyses, liquid limit, and plastic limit are used to assist in the classification of the soils.

Most highway engineers classify soil materials according to the AASHO system. In this system soil materials are classified in seven principal groups. The groups range from A–1, which consists of gravelly soils of high bearing capacity, to A–7, which consists of clay soils having low strength when wet.

Some engineers prefer to use the Unified soil classification system. In this system soil materials are divided into 15 classes: 8 classes are for coarse-grained materials (GW, GP, GM, GC, SW, SP, SM, SC), 6 classes are for fine-grained materials (ML, CL, OL, MH, CH, OH), and 1 class for highly organic material (Pt). Test data for the same kinds of soils in nearby areas, identification of the soils in the field by soil scientists, and past experience in construction were useful in estimating the engineering classifications of the soils of the survey area.

There is considerable variation in the texture (grain size) of glacial and water-deposited materials. Hence, the engineering soil classifications in table 4 will not apply to all areas of a soil mapping unit. Also, in establishing the engineering classifications, cobblestones and other stones larger than 3 inches in diameter were not considered. On many of the soils, particularly those derived from glacial till, it is difficult to install engineering structures because of the numerous large stones and boulders and the shallowness to bedrock. In some parts of the survey area, stones and boulders have been removed from the surface, but they occur in the subsoil and substratum. The Mapleton, Thorndike, and other soils that are shallow to bedrock require careful investigation when structures that need excavation are planned.

Permeability of the soil layers, as shown in table 4, was estimated for soil material as it occurs without compaction. The permeability estimates were based on soil structure, on local experience with soils, and on some laboratory measurements.

The available water, in inches per inch of depth, is an approximation of the capillary water in the soil when it is wet to field capacity. When the soil is "air dry," that amount of water will wet the soil material described (in table 4) to a depth of 1 inch without percolating deeper. The estimates of available water in table 4 are based on experience with the soils, field examinations, and some laboratory measurements.

The shrink-swell potential indicates the degree of volume change to be expected with a change in moisture content. It is estimated primarily on the basis of the amount and type of clay present. In general, soils classified as CH and A–7 (none in Southern Aroostook County) have a *high* shrink-swell potential. Clean sands and gravel (single grain) and those having small amounts of nonplastic to slightly plastic fines, as well as most other nonplastic to slightly plastic soil materials, have a *low* shrink-swell potential.

The pH values are not shown in table 4; most of the soils in Southern Aroostook County range from pH 5.0 to 5.6. The Caribou and Conant soils, however, are slightly calcareous in the lower part of the subsoil. Soils that are on glacial outwash and terraces and that are closely associated with the Caribou and Conant soils may also be calcareous in the lower subsoil. Such soils have a wide range of pH values, so tests may be needed to determine their reaction. Extremes in pH have an important effect on structural materials and influence the treatment that may be required to make soils stable.

Table 5 gives specific features of the soils that may affect engineering work and also rates the soils according to their suitability for various uses. The table serves as a guide to potential hazards or characteristics of the soils that require precaution in planning, designing, and constructing engineering structures. The ratings are given in such terms as *good*, *fair*, *not suitable*, and so on. The information in table 5 is based mostly on the interpretation of estimated physical properties given in table 4.

Highway Work

Frost action is one of the primary soil engineering problems in the survey area. While it might be desirable to suspend earthwork operations during the winter months to prevent the use of frozen soil materials for constructing embankments, it may not be economically feasible to do so.

In table 5, the soils are rated according to their adaptability to winter grading. The adaptability of the soils to winter grading depends largely on the texture of the soil material, its natural water content, and the depth to the water table during winter. Clay soils, when wet, are difficult to handle and must be dried to the proper moisture content for compaction, which is difficult to accomplish at this time of the year. Also, when they are frozen, clay soils may be difficult to excavate and should not be used in the compacted road section. Therefore, they are rated *poor* in table 5. Fine sands and silts with a high water table during the freezing period are also rated *poor*. In these soils extensive ice lenses can develop and, if the frozen material is placed in the compacted road section, differential settlement may occur in the embankment when the ice melts.

The rating of the soil as to its susceptibility to frost action depends on the texture of the soil material, the depth to the water table during the freezing period, and the length of time that the temperature is below freezing. Silts and fine sands with a high water table are rated *high*.

The susceptibility of the soil material to frost action has also been considered in rating the soils as sources of sand and gravel. In general, soils are not susceptible to frost action if less than 10 percent of the soil material passes the No. 200 sieve. Even if a soil is rated as a good source of sand and gravel, it may be necessary to explore extensively to find materials that meet this criterion.

The suitability of the soil materials for road subgrade and road fill (fig. 3) depends largely on the texture of the

***Figure 3.*—A gravel pit in Colton gravelly sandy loam, dark materials. Stratified sand and gravel from the substratum of this soil are used for road construction.**

soil material and its natural water content. Highly plastic soil materials are rated *poor* for road subgrade and *poor* or *fair* for road fill, depending on their natural water content and the ease with which they can be handled, dried, and compacted. Peat and swampy materials are *not suitable* for road subgrade or road fill. Highly erodible soils, such as those composed primarily of fine sands or silts, require moderately gentle slopes, close moisture control during compaction, and the establishment of fast-growing vegetation on side slopes. These soils are rated *poor* for road subgrade and *poor to fair* for road fill.

TABLE 4.—*Brief descriptions of the soils*

Map symbol	Soils	Depth to seasonally high water table	Brief site and soil description	Depth from surface (typical profile)
				Inches
CgA CgB CgC CgD CgE	Caribou gravelly loam, 0 to 2 percent slopes. Caribou gravelly loam, 2 to 8 percent slopes. Caribou gravelly loam, 8 to 15 percent slopes. Caribou gravelly loam, 15 to 25 percent slopes. Caribou gravelly loam, 25 to 45 percent slopes.	More than 5 feet	3 to 5 feet of well-drained loamy soil derived from glacial till, with shale fragments throughout, over bedded and shattered calcareous shale bedrock.	0 to 24 24 to 48
CnA CnB CnC CnD CnE	Colton gravelly sandy loam, dark materials, 0 to 2 percent slopes. Colton gravelly sandy loam, dark materials, 2 to 8 percent slopes. Colton gravelly sandy loam, dark materials, 8 to 15 percent slopes. Colton gravelly sandy loam, dark materials, 15 to 25 percent slopes. Colton gravelly sandy loam, dark materials, 25 to 45 percent slopes.	More than 5 feet	1½ feet of somewhat excessively drained gravelly and sandy soil over 2 or more feet of stratified sand and gravel.	0 to 18 18 to 120
CoA CoB CoC	Conant silt loam, 0 to 2 percent slopes. Conant silt loam, 2 to 8 percent slopes. Conant silt loam, 8 to 15 percent slopes.	About 1 foot	1½ feet of silty soil over 3 feet of compact silty glacial till; moderately well drained; more than 20 percent of soil material is shale fragments; lower subsoil usually calcareous.	0 to 18 18 to 48
DaA DaB DaC	Daigle silt loam, 0 to 2 percent slopes. Daigle silt loam, 2 to 8 percent slopes. Daigle silt loam, 8 to 15 percent slopes.	About 1 foot	1½ feet of silty soil over 4 feet of compact, silty and clayey, acid glacial till; moderately well drained; 20 percent or more of soil material is shale fragments.	0 to 18 18 to 48
Ha	Hadley silt loam.	(Flooded at times)	3 feet of well-drained, silty and sandy alluvial deposits.	0 to 36
HoA HoB HoC HvB HvC	Howland gravelly loam, 0 to 2 percent slopes. Howland gravelly loam, 2 to 8 percent slopes. Howland gravelly loam, 8 to 15 percent slopes. Howland very stony loam, 0 to 8 percent slopes. Howland very stony loam, 8 to 15 percent slopes.	About 1 foot	1 foot of moderately well drained loamy soil over 3 feet of acid, compact glacial till. The very stony types have numerous large stones and boulders on the surface and throughout the soil.	0 to 12 12 to 48
LnB LnC LnD	Linneus silt loam, 0 to 8 percent slopes. Linneus silt loam, 8 to 15 percent slopes. Linneus silt loam, 15 to 35 percent slopes.	More than 5 feet	2 feet of well-drained silty soil over bedded, shattered, dark-gray limestone and calcareous shale.	0 to 24
MaA MaB MaC	Machias gravelly loam, 0 to 2 percent slopes. Machias gravelly loam, 2 to 8 percent slopes. Machias gravelly loam, 8 to 15 percent slopes.	About 1 foot	2½ feet of moderately well drained gravelly soil over stratified sand-and-gravel glacial outwash.	0 to 30 30 to 48
MhB MhC MhD MmC MmD	Mapleton shaly silt loam, 0 to 8 percent slopes. Mapleton shaly silt loam, 8 to 15 percent slopes. Mapleton shaly silt loam, 15 to 35 percent slopes. Mapleton very rocky silt loam, 0 to 15 percent slopes. Mapleton very rocky silt loam, 15 to 35 percent slopes.	More than 5 feet	2 feet of well-drained shaly and silty soil over inclined, bedded, shattered limy shale bedrock. The very rocky types have numerous large rocks on the surface and throughout the soil.	0 to 24
Mn	Mixed alluvial land.	(Water table at surface.)	3 feet of poorly drained silty and sandy alluvial deposits; generally poorly drained.	0 to 36

See footnote at end of table.

and their estimated physical properties

Classification			Percentage passing sieve—			Permeability [1]	Available water	Shrink-swell potential
USDA texture	Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)			
							Inches per inch of depth	
Gravelly loam	SM–SC	A–4	70–80	60–70	40–45	Moderate	0.15 to 0.2	Moderate.
Gravelly loam	SC	A–4	75–85	65–75	40–45	Moderate	0.15 to 0.2	Moderate.
Gravelly sandy loam	GM	A–2	55–60	45–55	20–30	Moderate	0.1 to 0.14	Low.
Sand and gravel	SW–SM	A–1	60–70	40–50	5–10	Rapid	0.04 to 0.1	Low.
Silt loam	CL	A–4	75–85	70–80	50–60	Moderate	0.13 to 0.15	Moderate.
Loam	GM–GC	A–4	65–75	60–70	40–45	Slow	0.15 to 2.0	Moderate.
Gravelly silt loam	GM–GC	A–4	60–70	55–65	40–45	Moderate	0.13 to 0.15	Moderate.
Clay loam	CL	A–4	80–90	75–85	55–65	Slow	0.12 to 0.15	Moderate.
Silt loam	ML–CL	A–4	90–95	85–90	55–65	Moderate	0.17 to 0.20	Moderate.
Gravelly loam	ML–CL	A–4	90–95	85–90	55–60	Moderate	0.13 to 0.15	Moderate.
Gravelly loam	ML–CL	A–4	90–95	80–90	55–60	Slow	0.10 to 0.13	Low to moderate.
Silt loam	ML–CL	A–4	90–95	80–90	60–70	Moderate	0.13 to 0.15	Low.
Gravelly loam	GM; GM–GC	A–4	65–75	50–60	35–45	Moderate	0.13 to 0.16	Low.
Sand and gravel	GM–GC	A–2	50–60	40–50	25–35	Very rapid	0.10 to 0.04	Low.
Shaly silt loam	SM	A–1	60–65	45–55	15–20	Moderate	0.12 to 0.15	Low.
Silt loam	ML	A–4	70–80	65–75	60–65	Very slow	0.15 to 0.18	Moderate.

TABLE 4.—*Brief descriptions of the soils and*

Map symbol	Soils	Depth to seasonally high water table	Brief site and soil description	Depth from surface (typical profile)
				Inches
MoA	Monarda and Burnham silt loams, 0 to 2 percent slopes.	(Water table at surface.)	1½ feet of poorly drained silty soil over 5 feet of compact silty and shaly glacial till. Except that the Burnham soils have a highly organic surface layer 12 inches thick not used for engineering, the Monarda and Burnham soils are similar; the very stony types have many stones and boulders in and on the soil.	0 to 18
MoB	Monarda and Burnham silt loams, 2 to 8 percent slopes.			18 to 72
MrB	Monarda and Burnham very stony silt loams, 0 to 8 percent slopes.			
Pa	Peat and muck.	(Water table at surface.)	Highly organic material that varies in depth. Each site needs to be examined. Material not suitable for engineering purposes.	
PeA	Perham gravelly silt loam, 0 to 2 percent slopes	More than 5 feet	2 feet of well-drained silty soil over 2 feet of compact silty and clayey glacial till.	0 to 24
PeB	Perham gravelly silt loam, 2 to 8 percent slopes.			24 to 48
PeC	Perham gravelly silt loam, 8 to 15 percent slopes.			
PeD	Perham gravelly silt loam, 15 to 25 percent slopes.			
PgB	Plaisted gravelly loam, 0 to 8 percent slopes.	More than 5 feet	1½ feet of well-drained gravelly loam over 2½ feet of compact, acid glacial till. The very stony types have numerous stones and boulders on the surface and throughout the soil.	0 to 18
PgC	Plaisted gravelly loam, 8 to 15 percent slopes.			18 to 48
PgD	Plaisted gravelly loam, 15 to 25 percent slopes.			
PrB	Plaisted very stony loam, 0 to 8 percent slopes.			
PrC	Plaisted very stony loam, 8 to 15 percent slopes.			
PrD	Plaisted very stony loam, 15 to 25 percent slopes.			
PrE	Plaisted very stony loam, 25 to 45 percent slopes.			
PvB	Plaisted and Howland very stony loams, 0 to 8 percent slopes.	1 to 5 feet	See descriptions of Plaisted soils and of Howland soils.	
PvC	Plaisted and Howland very stony loams, 8 to 15 percent slopes.			
RaA	Red Hook and Atherton silt loams, 0 to 2 percent slopes.	(Water table at surface.)	2 feet of poorly drained silty and gravelly soil over stratified sand and gravel outwash. Except that the Atherton soils are very poorly drained and have a surface layer 1 foot thick not used for engineering, the Red Hook and Atherton soils are similar.	0 to 20
RaB	Red Hook and Atherton silt loams, 2 to 8 percent slopes.			20 to 40
SgA	Stetson gravelly loam, 0 to 2 percent slopes.	More than 5 feet	1½ feet of well-drained gravelly loam over gravelly loamy sand or stratified sand and gravel.	0 to 18
SgB	Stetson gravelly loam, 2 to 8 percent slopes.			18 to 40
ThB	Thorndike shaly silt loam, 0 to 8 percent slopes.	More than 5 feet	1½ feet of well-drained shaly and silty soil over bedded and shattered shale bedrock. The very rocky types have numerous large stones and boulders on the surface and throughout the soil.	0 to 18
ThC	Thorndike shaly silt loam, 8 to 15 percent slopes.			
ThD	Thorndike shaly silt loam, 15 to 25 percent slopes.			
ThE	Thorndike shaly silt loam, 25 to 45 percent slopes.			
TkB	Thorndike very rocky silt loam, 0 to 8 percent slopes.			
TkC	Thorndike very rocky silt loam, 8 to 15 percent slopes.			
TkD	Thorndike very rocky silt loam, 15 to 25 percent slopes.			
TkE	Thorndike very rocky silt loam, 25 to 45 percent slopes.			
TsB	Thorndike and Howland soils, 0 to 8 percent slopes.	-------------------	See descriptions of Thorndike soils and of Howland soils.	
TsC	Thorndike and Howland soils, 8 to 15 percent slopes.			
Wn	Winooski silt loam.	(Flooded occasionally.)	3 feet of moderately well drained silty and fine sandy soil derived from alluvial deposits.	0 to 36

[1] Terms used to describe permeability and the rates of percolation, in inches per hour, are: Very slow, less than 0.20; slow, 0.20 to

their estimated physical properties—Continued

Classification			Percentage passing sieve—			Permeability [1]	Available water	Shrink-swell potential
USDA texture	Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)			
							Inches per inch of depth	
Silt loam	ML	A–4	85–90	80–85	55–60	Moderate	0.15 to 0.18	Moderate.
Silt loam	ML–CL	A–4	85–90	80–85	55–60	Slow	0.15 to 0.21	Moderate.
Gravelly silt loam	GM-GC	A–4	60–65	55–65	35–45	Moderate	0.15 to 0.20	Moderate.
Clay loam	CL	A–6	75–85	70–80	55–65	Slow	0.15 to 0.20	Moderate.
Gravelly loam	SM	A–4	75–85	70–80	40–45	Moderate	0.17 to 0.18	Low.
Gravelly loam	SM	A–2	55–65	45–55	20–30	Slow	0.15 to 0.18	Low.
Gravelly silt loam	ML-CL	A–4	70–80	65–75	55–60	Moderate	0.15 to 0.20	Moderate.
Gravelly loam	GM-GC	A–2	55–65	40–50	25–30	Rapid	Less than 0.04.	Low.
Gravelly loam	SM	A–4	75–85	65–75	40–45	Moderate	0.12 to 0.21	Low.
Gravelly loamy sand	SP–SM	A–1	55–65	55–60	10–20	Very rapid	0.04 to 0.10	Low.
Shaly silty loam	SM	A–1	60–65	45–55	15–20	Moderate	0.11 to 0.15	Low.
Silt loam	ML–CL	A–4	90–75	85–95	55–60	Moderate	0.15 to 0.20	Moderate.

0.63; moderate, 0.63 to 2.00; rapid, 2.00 to 6.30; very rapid, more than 6.30.

TABLE 5.—*Engineering*

[Made land is too variable to rate for engineering

Soil and map symbols	Adaptability to winter grading	Susceptibility to frost action	Suitability of soil material for—		Suitability as source of—		Suitability for ponds
			Road subgrade	Road fill	Topsoil	Sand and gravel	Reservoir
Caribou gravelly loams (CgA, CgB, CgC, CgD, CgE).	Fair	Moderate	Fair	Good	Good	Not suitable	Poor; need treatment.
Colton gravelly sandy loams, dark materials (CnA, CnB, CnC, CnD, CnE).	Good	Low	Good	Good	Not suitable	Good	Poor; excessive seepage.
Conant silt loams (CoA, CoB, CoC).	Fair	High	Fair	Fair	Good	Not suitable	Good; shallowness to bedrock may be a problem.
Daigle silt loams (DaA, DaB, DaC).	Fair	Moderate	Fair	Fair	Fair	Not suitable	Good
Hadley silt loam (Ha)	Poor	High	Fair	Fair	Good	Not suitable	Poor; subject to flooding.
Howland gravelly loams (HoA, HoB, HoC).	Fair	High	Fair	Fair	Good	Not suitable	Good
Howland very stony loams (HvB, HvC).	Fair	High	Fair	Fair	Good; some problems with surface stones.	Not suitable	Good
Linneus silt loams (LnB, LnC, LnD).	Fair	Moderate	Good	Fair	Fair	Not suitable	Poor; shallow soil
Machias gravelly loams (MaA, MaB, MaC).	Poor	High	Good	Good	Fair	Fair; limited by high water table.	Poor; moderately permeable layers of sand and gravel; seepage in places.
Mapleton shaly silt loams (MhB, MhC, MhD).	Fair	Low	Good	Fair	Not suitable	Not suitable	Poor; excessive seepage and shallow soil.
Mapleton very rocky silt loams (MmC, MmD).	Fair	Low	Good	Fair between outcrops.	Not suitable	Not suitable	Poor; excessive seepage and shallow soil.
Mixed alluvial land (Mn)	Poor	High	Poor to fair.	Fair	Poor	Not suitable	Poor; high water table and flooding.
Monarda and Burnham silt loams (MoA, MoB).	Poor	High	Fair	Fair	Not suitable	Not suitable	Good; high water table.
Monarda and Burnham very stony silt loams (MrB).	Poor	High	Fair	Fair	Not suitable	Not suitable	Good; high water table.
Peat and muck (Pa)	Not suitable.	High	Not suitable.	Not suitable.	Not suitable	Not suitable	Poor; only dug-out ponds satisfactory.

interpretations of the soils

work and is not listed in this table]

Suitability for ponds—continued	Soil features affecting engineering practices				
Embankment	Vertical alinement in highways	Agricultural drainage	Irrigation	Diversion terraces	Waterways
Poor	No unfavorable features, except boulders.	(Not needed)	Moderately low intake rate; good water-holding capacity.	Long slopes subject to erosion.	Subject to erosion.
Poor; rapidly permeable.	No unfavorable features.	(Not needed)	High intake rate; low water-holding capacity.	Loose subsoil	Erodible; loose subsoil.
Fair; may contain shale.	Seepage and boulders	Compact subsoil; high water table.	Moderately low intake rate; good water-holding capacity.	Compact subsoil	Subject to erosion.
Good for small dams.	Seepage and erosion on cut slopes.	Compact subsoil; fine texture.	Low intake rate; good water-holding capacity.	Compact subsoil	Subject to erosion and seepage.
Fair	Subject to overflow	(Not needed)	Moderate intake rate; good water-holding capacity.	May be flooded occasionally.	Subject to erosion and flooding.
Good	Seepage and erosion on cut slopes; bouldery.	Compact subsoil	Low intake rate; good water-holding capacity.	Compact subsoil	Subject to erosion.
Good	Seepage and erosion on cut slopes; bouldery.	Compact subsoil	Low intake rate; good water-holding capacity.	Compact subsoil	Subject to erosion.
Poor; inadequate strength and stability.	Shallow to bedrock	(Not needed)	Moderate intake rate; fair water-holding capacity.	Shallow to bedrock	Shallow to bedrock.
Fair; may be used if well compacted and mixed.	Seepage	Sand and gravel lenses; cut slopes subject to seepage and sloughing.	Moderately low intake rate; fair water-holding capacity.	Seepage in places	Subject to erosion in places.
Poor; inadequate strength and stability.	Shallow to bedrock	(Not needed)	Moderate intake rate; fair water-holding capacity.	Shallow to bedrock	Shallow to bedrock.
Poor; inadequate strength and stability.	Shallow to bedrock	(Not needed)	(Not irrigated)	Shallow to bedrock	Shallow to bedrock.
Fair, when mixed	High water table most of the year; subject to flooding.	Flooding and high water table.	(Not irrigated)	(Not needed)	High water table.
Good, when dry	High water table; seepage along top of compact layer; bouldery.	High water table; slow internal movement of water.	(Not irrigated)	Wet or very wet soils	High water table.
Good, when dry	High water table; seepage along top of compact layer; bouldery.	High water table; slow internal movement of water.	(Not irrigated)	Wet or very wet soils	High water table.
Not suitable	Unstable; high water table.	High water table; sloughing.	(Not irrigated)	(Not needed)	(Not needed).

TABLE 5.—*Engineering*

Soil and map symbols	Adaptability to winter grading	Susceptibility to frost action	Suitability of soil material for—		Suitability as source of—		Suitability for ponds
			Road subgrade	Road fill	Topsoil	Sand and gravel	Reservoir
Perham gravelly silt loams (PeA, PeB, PeC, PeD).	Fair	Moderate	Fair	Fair	Fair	Not suitable	Good
Plaisted gravelly loams (PgB, PgC, PgD).	Fair	Moderate	Fair	Fair	Fair	Not suitable	Fair; may be underlain by shale.
Plaisted very stony loams (PrB, PrC, PrD, PrE).	Fair	Moderate	Fair	Fair	Fair; some problems with surface stones.	Not suitable	Fair; may be underlain by shale.
Plaisted and Howland very stony loams (PvB, PvC).	For specific areas, see Plaisted soils and Howland soils that are rated separately.						
Red Hook and Atherton silt loams (RaA, RaB).	Poor	High	Fair	Fair	Fair	Poor; limited by high water table.	Fair; high water table and sand lenses.
Stetson gravelly loams (SgA, SgB).	Good	Low	Good	Good	Fair	Good	Poor; excessive seepage.
Thorndike shaly silt loams (ThB, ThC, ThD, ThE).	Fair	Low	Fair	Fair	Poor	Not suitable	Poor; excessive seepage and shallow soil.
Thorndike very rocky silt loams (TkB, TkC, TkD, TkE).	Fair	Low	Fair	Fair between rock outcrops.	Poor	Not suitable	Poor; excessive seepage and shallow soil.
Thorndike and Howland soils (TsB, TsC).	For specific areas, see Thorndike soils and Howland soils that are rated separately.						
Winooski silt loam (Wn)	Poor	High	Fair	Fair	Good	Not suitable	Poor; subject to flooding.

interpretations of the soils—Continued

Suitability for ponds—continued	Soil features affecting engineering practices				
Embankment	Vertical alinement in highways	Agricultural drainage	Irrigation	Diversion terraces	Waterways
Good, if compacted.	Seepage on cut slopes; bouldery.	(Not needed)	Moderately low intake rate; good water-holding capacity.	Compact layer in subsoil.	Subject to erosion; compact layer.
Good	Seepage on cut slopes; bouldery.	(Not needed)	Moderately low intake rate; good water-holding capacity.	Compact subsoil	Subject to erosion; compact subsoil.
Good	Seepage on cut slopes; bouldery.	(Not needed)	Moderately low intake rate; good water-holding capacity.	Compact subsoil	Subject to erosion; compact subsoil.
Fair	High water table	High water table; unstable cut banks.	(Not irrigated)	Seepage	Continuous flow from high water table.
Poor; rapidly permeable.	No unfavorable features.	(Not needed)	Moderately high intake rate; fair water-holding capacity.	Loose substrata	Subject to erosion; loose subsoil.
Poor; inadequate strength and stability.	Shallow to bedrock	(Not needed)	Moderately high intake rate; fair water-holding capacity.	Shallow to bedrock	Shallow to bedrock.
Poor; inadequate strength and stability.	Shallow to bedrock	(Not needed)	(Not irrigated)	Shallow to bedrock	Shallow to bedrock.
Fair, if well compacted and dry.	Periodic high water table; subject to flooding.	Flooding; fine texture.	Moderate intake rate; good water-holding capacity.	(Not needed)	Subject to flooding.

The ratings given in table 5 for the soils as sources of topdressing for slopes of embankments, ditches, and cut slopes, were developed for the survey area. Normally, only the material from the uppermost layer is used, and the ratings apply only to nonstony soils.

A perched water table that occurs in some of the soils on glacial till is caused by a compact, platy layer that is slowly permeable to water. Seepage may occur along the top of this layer. When roads are to be constructed on soils that have a perched water table, a survey should be made to determine the need for underdrains. In highway cuts some underdrains will be needed. The requirements for underdrains should be determined by field exploration.

Seepage in back slopes of roadcuts may cause the overlying material to slump or slide. If the perched water table is only at a slight depth below the pavement, differential volume change may occur, particularly within the depth of freezing, and the decrease in bearing capacity of the saturated or thawed foundation material may cause the pavement to deteriorate. Pockets of wet, fine-grained soil material should be removed and replaced by coarser grained material.

Some of the glacial till consists of fine sand and silt that is susceptible to frost heave. Where such material occurs, a sufficient thickness of free-draining material should be used in the highway subgrade to prevent detrimental heaving of the pavement. If there are pockets of fine-grained soil material in the coarse-grained material, differential frost heave can be prevented by mixing these materials so that heaving will be uniform. Differential frost heave can also be prevented by using a sufficient thickness of very permeable sandy gravel or coarse sand in the upper part of the subgrade.

In thick glacial till, bedrock may be exposed in deep cuts. In shallow glacial till, the gradeline should be kept high so that the excavation of the bedrock will be minimized and so that seepage, which occurs at the point where the till and bedrock meet, will be avoided. Adequate surface drainage and underdrainage should be provided, and coarse-grained soil material should be used in the upper part of the subgrade. Because they are fine textured and the water table is near the surface, soils formed in slackwater deposits of silts and clays do not make good foundations. Roads should be built on embankments over such soils, but this may not be practical, especially if good material is not available. If wet, fine-textured soil material is used in the subgrades or in the embankments, the moisture content must be reduced so that it is only slightly above the optimum. Otherwise, adequate compaction cannot be obtained. The gradeline should be kept above the water table.

Peat and muck are not suitable for use as foundations for roads or other engineering structures, because of the low strength of the material and because the water table is normally high. These organic soils are subject to subsidence and shrinkage. Roads should be alined to avoid deep muck. Peat and muck within a cut section of a roadway and at embankment sites should be wasted or removed and replaced by suitable soil materials. Some areas of peat and muck may be too small to be shown on the soil map.

Construction of roads on river terraces ordinarily involves a minimum of earthwork, except where the road rises to a high terrace or into the uplands. On terraces and on alluvial bottoms, the gradeline should be kept above the level reached by highest floods.

Gravelly soils, if properly compacted, form good subgrades for roads. Roads constructed in glacial outwash generally require somewhat less earthwork than those constructed in other deposits.

All topsoil that contains too much organic matter should be removed in constructing embankments 5 feet or more in height.

Soil and Water Conservation Work

In the survey area the principal engineering structures and practices used to conserve soil and water are agricultural drainage, irrigation, farm ponds, diversions, and waterways.

Some of the soils derived from glacial till are underlain by a compact, platy substratum that retards the movement of water. When planning to install irrigation systems in these soils or in the soils that are shallow to bedrock, careful investigation is necessary because of the limited depth of tillable soil.

Furthermore, seepage usually occurs along the top of this compact layer and results in wet spots. Interception drains—both diversion terraces and subsurface drains—may be required.

Most of the glacial till soils in the survey area are slowly permeable and are suitable for the construction of farm ponds. Nevertheless, some of the soils, such as Caribou and Conant, may contain sand lenses that may cause excess seepage from the reservoir. These sand lenses may also cause piping and unstable conditions for the installation of drainage structures.

Soils formed in glacial outwash, as a rule, are composed of larger particles than soils formed in glacial till, and they are more permeable. If farm ponds for storing water above ground are planned for soils formed in outwash, a sealing agent should be used to prevent seepage of water from the reservoir. Where the water table is close to the surface of these soils, ponds dug for storing water below the surface have been successful. When installing open ditches or subsurface drains in soils formed in outwash, care is necessary where there are layers of ungraded silts, fine sands, or sands, because these layers are subject to erosion, sloughing, and slumping. Subsurface drainage systems installed in such layers must be protected by filters that prevent the systems from being plugged with silts and fine sands. The soils formed in outwash are normally droughty and have a low water-holding capacity. These factors should be considered when planning an irrigation system.

Descriptions of the Soils

The soils shown on the detailed soil map are described in this section. The descriptions are arranged alphabetically by soil series. A general description of each series is given, and this is followed by a profile description of a soil that represents the series. Soil colors are given for moist soil. Symbols following the names of colors are Munsell color notations that indicate *hue*, *value*, and *chroma*.

After the description of the series, each soil within the series is described in relation to the representative profile of the series or to other soils within the series. A symbol following the name of each soil is the one used to identify areas on the detailed soil map. Some basic facts about use and management are given for each soil. Also, in the description of each soil, there is a reference to the capability unit to which the soil belongs. The capability units are described in the section "Use and Management of the Soils."

Some of the soils of Southern Aroostook County are not classified within soil series but are called miscellaneous land types. Examples are Made land and Mixed alluvial land.

To describe the soils in detail, the soil scientists have used some technical terms, such as *bisequal*, *bulk density*, *illuvial*, etc. Definitions of these terms, as well as other technical terms, are given in the Glossary at end of the text. Also in the Glossary are definitions of the various horizons in the soil profile. The section "How Soils Are Named, Mapped, and Classified" tells how the soil survey was made.

The approximate acreage and proportionate extent of the soils in Southern Aroostook County are given in table 6.

TABLE 6.—*Approximate acreage and proportionate extent of the soils*

Map symbol	Soil	Area	Extent	Map symbol	Soil	Area	Extent
		Acres	*Percent*			*Acres*	*Percent*
CgA	Caribou gravelly loam, 0 to 2 percent slopes	454	0. 1	MaB	Machias gravelly loam, 2 to 8 percent slopes	846	0. 1
CgB	Caribou gravelly loam, 2 to 8 percent slopes	11, 195	1. 1	MaC	Machias gravelly loam, 8 to 15 percent slopes	76	(1)
CgC	Caribou gravelly loam, 8 to 15 percent slopes	3, 002	. 3	Md	Made land	280	(1)
CgD	Caribou gravelly loam, 15 to 25 percent slopes	715	. 1	MhB	Mapleton shaly silt loam, 0 to 8 percent slopes	16, 716	1. 7
CgE	Caribou gravelly loam, 25 to 45 percent slopes	197	(1)	MhC	Mapleton shaly silt loam, 8 to 15 percent slopes	10, 232	1. 0
CnA	Colton gravelly sandy loam, dark materials, 0 to 2 percent slopes	250	(1)	MhD	Mapleton shaly silt loam, 15 to 35 percent slopes	2, 482	. 2
CnB	Colton gravelly sandy loam, dark materials, 2 to 8 percent slopes	5, 989	. 6	MmC	Mapleton very rocky silt loam, 0 to 15 percent slopes	747	. 1
CnC	Colton gravelly sandy loam, dark materials, 8 to 15 percent slopes	3, 036	. 3	MmD	Mapleton very rocky silt loam, 15 to 35 percent slopes	877	. 1
CnD	Colton gravelly sandy loam, dark materials, 15 to 25 percent slopes	1, 432	. 1	Mn	Mixed alluvial land	6, 227	. 6
CnE	Colton gravelly sandy loam, dark materials, 25 to 45 percent slopes	1, 368	. 1	MoA	Monarda and Burnham silt loams, 0 to 2 percent slopes	244, 357	24. 6
CoA	Conant silt loam, 0 to 2 percent slopes	2, 576	. 3	MoB	Monarda and Burnham silt loams, 2 to 8 percent slopes	39, 527	4. 0
CoB	Conant silt loam, 2 to 8 percent slopes	6, 077	. 6	MrB	Monarda and Burnham very stony silt loams, 0 to 8 percent slopes	25, 712	2. 6
CoC	Conant silt loam, 8 to 15 percent slopes	201	(1)	Pa	Peat and muck	49, 479	5. 0
DaA	Daigle silt loam, 0 to 2 percent slopes	111	(1)	PeA	Perham gravelly silt loam, 0 to 2 percent slopes	185	(1)
DaB	Daigle silt loam, 2 to 8 percent slopes	1, 855	. 2	PeB	Perham gravelly silt loam, 2 to 8 percent slopes	8, 203	. 8
DaC	Daigle silt loam, 8 to 15 percent slopes	206	(1)	PeC	Perham gravelly silt loam, 8 to 15 percent slopes	2, 944	. 3
Ha	Hadley silt loam	229	(1)	PeD	Perham gravelly silt loam, 15 to 25 percent slopes	902	. 1
HoA	Howland gravelly loam, 0 to 2 percent slopes	5, 249	. 5	PgB	Plaisted gravelly loam, 0 to 8 percent slopes	23, 480	2. 4
HoB	Howland gravelly loam, 2 to 8 percent slopes	41, 248	4. 2	PgC	Plaisted gravelly loam, 8 to 15 percent slopes	4, 834	. 5
HoC	Howland gravelly loam, 8 to 15 percent slopes	2, 804	. 3	PgD	Plaisted gravelly loam, 15 to 25 percent slopes	1, 045	. 1
HvB	Howland very stony loam, 0 to 8 percent slopes	27, 631	2. 8	PrB	Plaisted very stony loam, 0 to 8 percent slopes	11, 447	1. 2
HvC	Howland very stony loam, 8 to 15 percent slopes	1, 985	. 2	PrC	Plaisted very stony loam, 8 to 15 percent slopes	6, 997	. 7
LnB	Linneus silt loam, 0 to 8 percent slopes	1, 425	. 1	PrD	Plaisted very stony loam, 15 to 25 percent slopes	1, 694	. 2
LnC	Linneus silt loam, 8 to 15 percent slopes	1, 293	. 1	PrE	Plaisted very stony loam, 25 to 45 percent slopes	1, 510	. 2
LnD	Linneus silt loam, 15 to 35 percent slopes	555	. 1	PvB	Plaisted and Howland very stony loams, 0 to 8 percent slopes	112, 212	11. 3
MaA	Machias gravelly loam, 0 to 2 percent slopes	243	(1)	PvC	Plaisted and Howland very stony loams, 8 to 15 percent slopes	9, 316	. 9
				RaA	Red Hook and Atherton silt loams, 0 to 2 percent slopes	1, 369	. 1

See footnote at end of table.

TABLE 6.—*Approximate acreage and proportionate extent of the soils*—Continued

Map symbol	Soil	Area	Extent	Map symbol	Soil	Area	Extent
		Acres	*Percent*			*Acres*	*Percent*
RaB	Red Hook and Atherton silt loams, 2 to 8 percent slopes	1,261	0.1	TkC	Thorndike very rocky silt loam, 8 to 15 percent slopes	25,042	2.5
SgA	Stetson gravelly loam, 0 to 2 percent slopes	573	.1	TkD	Thorndike very rocky silt loam, 15 to 25 percent slopes	13,876	1.4
SgB	Stetson gravelly loam, 2 to 8 percent slopes	319	(1)	TkE	Thorndike very rocky silt loam, 25 to 45 percent slopes	2,110	.2
ThB	Thorndike shaly silt loam, 0 to 8 percent slopes	47,814	4.8	TsB	Thorndike and Howland soils, 0 to 8 percent slopes	62,491	6.3
ThC	Thorndike shaly silt loam, 8 to 15 percent slopes	33,344	3.4	TsC	Thorndike and Howland soils, 8 to 15 percent slopes	58,973	5.9
ThD	Thorndike shaly silt loam, 15 to 25 percent slopes	29,170	2.9	Wn	Winooski silt loam	798	.1
ThE	Thorndike shaly silt loam, 25 to 45 percent slopes	2,386	.2		Small bodies of water ordinarily included in land area	6,433	.6
TkB	Thorndike very rocky silt loam, 0 to 8 percent slopes	3,736	.4		Total	993,348	100.0

[1] Less than 0.1 percent.

Atherton Series

In this series are very poorly drained soils on acid sandy and gravelly deposits. The sand and gravel were derived mainly from shale, slate, and sandstone. The soils formed under the influence of a high water table and are mainly in depressions. They are associated with Stetson and Colton soils.

The Atherton soils have a thick, dark-gray, weakly mottled A1 horizon that, in some places, is underlain by a thin, grayish-brown, mottled A2g horizon. In most places, however, there are grayish-brown and olive-gray, mottled B21g and B22g horizons directly below the A1 horizon. Below a depth of about 4 feet, these soils are underlain by stratified sand and gravel.

The Atherton soils are members of the catena that includes the somewhat excessively drained Colton, well-drained Stetson, moderately well drained Machias, and poorly drained Red Hook soils.

Spruce, fir, swamp maple, and elm grow on most of these soils, which are too wet to be cleared for crops.

In Southern Aroostook County, the Atherton soils are mapped with the Red Hook soils in undifferentiated units. These units are described under the Red Hook series.

Representative profile—Atherton silt loam, 0 to 2 percent slopes (pastured):

A1—0 to 7 inches, very dark grayish-brown (10YR 3/2) silt loam with few, fine, faint, grayish-brown mottles; moderate, medium, granular structure; friable; strongly acid; clear, smooth boundary; 6 to 12 inches thick.

B21g—7 to 15 inches, grayish-brown (2.5Y 5/2) fine sandy loam with common, fine, prominent, strong-brown and grayish-brown mottles; weak, fine, granular structure; firm in place; strongly acid; clear, wavy boundary; 5 to 10 inches thick.

B22g—15 to 30 inches, olive-gray (5Y 5/2) fine sandy loam with many, medium, prominent, strong-brown and grayish-brown mottles; weak, fine, granular structure; firm in place; medium acid; 10 percent of mass is fine gravel; clear, wavy boundary; 10 to 20 inches thick.

C1g—30 to 36 inches, olive (5Y 5/3) sandy loam with few, fine, faint, olive-gray mottles; weak, fine, granular structure; friable; medium acid; 15 percent of mass is fine- and medium-sized gravel.

Burnham Series

The Burnham series is made up of soils on very firm, slightly acid to neutral gravelly loam glacial till of Wisconsin age. The till was derived mainly from shale, slate, phyllite, and sandstone. These very poorly drained soils occur in nearly level and depressional areas where the water table is at the surface from 6 to 9 months of the year.

Most areas of these soils are forested and have rough microrelief that consists of mounds, 1 to 3 feet high, that probably resulted from the windthrow of trees. The A1 horizon is generally 6 to 10 inches thick, and in the mounds it is underlain by a gray, mottled A2g horizon, 1 to 2 inches thick. The low spots between the mounds generally have a weakly developed A2g horizon, but in some places the A1 is underlain by a B21g horizon.

The B horizons are olive-gray silt loam and gravelly loam and have distinct mottling. They grade from weak, granular structure to thin, platy and are generally firm throughout. In some places the B horizons have thin clay films and weak, subangular blocky structure.

The C horizon is olive-gray gravelly loam that is mottled. In structure it grades from platy to massive. It is generally of very firm consistence and is medium to slightly acid.

Most areas of Burnham soils are very stony, and in some places the surface is nearly covered with small stones. In some areas, stones 10 to 15 inches in diameter are scattered over the surface at intervals of 5 to 10 feet. In other areas granite and sandstone boulders, 3 to 5 feet in diameter, are partly embedded in the soils.

The Burnham soils are members of the same catena as the well drained Plaisted, moderately well drained Howland, and poorly drained Monarda soils. The Burnham soils are nearly saturated 9 months of the year. The common vegetation is black spruce, red spruce, and fir.

In Southern Aroostook County, the Burnham soils are mapped with the Monarda soils in undifferentiated units. These undifferentiated units are described under the Monarda series.

Representative profile—Burnham very stony silt loam, 0 to 2 percent slopes (forested):

A0—4 inches to 0, very dark brown (10YR 2/2), partly decomposed organic material; strongly acid; many partly embedded stones; abrupt, smooth boundary; 2 to 10 inches thick.

A1—0 to 9 inches, very dark grayish-brown (10YR 3/2) silt loam with few, fine, faint, gray mottles; moderate, fine, granular structure; friable; strongly acid; abrupt, wavy boundary; 3 to 10 inches thick.

A2g—9 to 11 inches, light brownish-gray (10YR 6/2) silt loam with few, fine, faint, brown mottles; weak, thin, platy structure; friable; medium acid; 15 to 20 percent of mass is coarse fragments; abrupt, wavy boundary; 1 to 5 inches thick.

B21gm—11 to 15 inches, olive-gray (5Y 5/2) silt loam with common, medium, distinct, olive-brown and yellowish-brown mottles; moderate, medium, platy structure; firm; medium acid; 20 to 30 percent of mass is coarse fragments; clear, wavy boundary; 3 to 10 inches thick.

B22gm—15 to 21 inches, olive-gray (5Y 5/2) gravelly loam with many, coarse, distinct, gray and yellowish-brown mottles; moderate, thin, platy structure; firm; brittle; medium acid; 20 to 30 percent of mass is coarse fragments; clear, wavy boundary; 4 to 12 inches thick.

B3gm—21 to 28 inches, olive-gray (5Y 5/2) loam with common, fine, gray mottles; moderate, thin, platy structure; firm; brittle when dry; medium to slightly acid; 20 to 30 percent of mass is coarse fragments; clear, wavy boundary; 5 to 15 inches thick.

Cgm—28 to 36 inches +, olive-gray (5Y 5/2) gravelly loam with few, fine, faint, light-gray mottles; massive; very firm; slightly acid to neutral; 25 to 30 percent of mass is coarse fragments.

Caribou Series

In the Caribou series are well-drained, medium-textured soils on slightly firm glacial till derived from limestone and shale. The soils are generally about 48 inches thick, but in some places they are 10 feet thick over limestone.

Most areas of the Caribou soils occur in the townships along the Canadian border and extend northward from the town of Hodgdon. Other areas are in the townships of Linneus and New Limerick.

The Caribou soils are associated with the moderately well drained Conant soils, which also are on glacial till derived from limestone. These two kinds of soils are confined mainly to gently rolling ridges.

Only a few stones occur in till derived from limestone. In fact, the Caribou soils are the least stony of the soils in the county that were derived from till. Most stones are flat, angular fragments of shale and limestone. The Caribou soils developed under a cover of northern hardwoods. Most areas are now used for crops.

The Caribou soils developed under a cover of northern hardwoods. Most areas are now used for crops.

Representative profile—Caribou gravelly loam, 2 to 8 percent slopes (cultivated):

Ap—0 to 9 inches, brown (10YR 5/3) gravelly loam; moderate, fine, granular structure; friable; strongly acid; abrupt, smooth boundary; 8 to 11 inches thick.

B21—9 to 11 inches, yellowish-red (5YR 5/8) gravelly loam; weak, fine, granular structure; friable; strongly acid; clear, wavy boundary; 2 to 10 inches thick.

B22—11 to 17 inches, strong-brown (7.5YR 5/6) gravelly loam; weak, medium, granular structure; friable; strongly acid; clear, wavy boundary; 4 to 8 inches thick.

A'2—17 to 26 inches, light olive-brown (2.5YR 5/6) gravelly loam; granular structure; friable; strongly acid; clear, wavy boundary; 5 to 10 inches thick.

B'21—26 to 39 inches, brown (10YR 5/3) gravelly silt loam; 40 to 50 percent of mass is coarse, highly weathered shale fragments; weak, subangular blocky structure; strongly acid; slightly firm in place; clear, wavy boundary; 10 to 18 inches thick.

B'22—39 to 58 inches, yellowish-brown (10YR 5/4) silt loam; 50 percent of mass is coarse fragments; subangular blocky structure; slightly firm to friable; clay films on peds; medium acid; clear, wavy boundary; 10 to 20 inches thick.

C—58 inches +, brown (10YR 5/3) gravelly loam; massive; firm; neutral to alkaline; 50 to 60 percent of mass is coarse fragments.

Caribou gravelly loam, 0 to 2 percent slopes (CgA).—Some of this soil is forested, but most of it is cultivated and has a profile similar to the one described as representative for the series. The plow layer is generally 9 to 12 inches thick, and it contains less gravel than that of the more sloping Caribou soils.

The water table, during most of the growing season, is 5 feet or more below the surface. Permeability is moderate, although slightly slower than that for other soils of the Caribou series. Water often stands on the surface of the soil for a few hours after a heavy rain, but during the greater part of the growing season, water and air move freely through the soil.

Roots easily penetrate the soil to a depth of 24 inches, and a few extend to 36 inches. The soil is normally slightly firm at a depth of 36 inches, and only deep-rooted plants send roots much below this depth. The upper part of the slightly firm layer has many cracks through which roots can enter. Runoff is slow; the soil seldom erodes.

This nearly level soil occurs on the tops of ridges where air drainage is good, and consequently, the frost-free period is a few days longer than that for some of the other soils at high elevations. The soil and climate are well suited to potatoes, peas, oats, grasses, and legumes. Capability unit IIc-3.

Caribou gravelly loam, 2 to 8 percent slopes (CgB).—Some of this soil is forested, and in these areas the A1 horizon is very dark grayish-brown silt loam, ½ to 3 inches thick. This horizon consists of a mixture of mineral and organic matter. It is acid (pH 4.5 to 5.0) but is fairly high in exchangeable calcium and potassium. Below the A1 horizon is a brownish-gray or nearly white loam or silt loam A2 horizon that is acid (about pH 4.5) and is low in organic matter, in exchangeable calcium, and in potassium. The A2 horizon is from ½ to 3 inches thick, and in many places it occurs as pockets. It is underlain by a B21 horizon of dark-brown or dark reddish-brown gravelly loam, about 3 inches thick. Below the B21 horizon, the forested soil is similar to the cultivated soil, a profile of which is given under the series description.

In forested areas stones, 6 inches to 2 feet in diameter, are on the surface at intervals of 100 to 200 feet.

The Ap horizon in cultivated areas is a mixture of what was formerly the A1, A2, and part of the B21 horizons. In some places the Ap horizon is underlain by part of the original B21. In other places the entire B21 horizon has been mixed with the upper horizons and is part of the present Ap horizon.

Stones larger than 6 inches in diameter have been removed from most fields. Gravel and cobblestones are common on the surface, although in places most of the cobblestones and some of the coarse gravel have been removed.

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The plow layer holds about 1.5 inches of water available for plants, and the top 30 inches of soil holds about 6 inches of available water. If rainfall is normal, there is enough moisture for high yields of potatoes. The water table is usually more than 5 feet below the surface. Water seldom stands on the surface because the soil is moderately to rapidly permeable. Roots commonly extend to a depth of 3 feet. At 3 feet the soil, in most places, is firm and has a bulk density of 1.50 or higher. This limits root penetration for most plants, but the roots of some legumes penetrate cracks in the subsoil.

Some of this soil has been used intensively for potatoes and has received large applications of fertilizer. This has resulted in a buildup of available plant nutrients.

Surface runoff is medium in cultivated areas, and medium to slow in good pastures. Fields that are used for row crops are subject to erosion because many of the slopes are 1,000 feet or more in length and the speed of runoff builds up. In addition about 50 percent of the soil is silt- and clay-sized particles that can be held in suspension in slow-moving water. Contour stripcropping helps to control erosion and to conserve plant nutrients and water.

The soil and climate are well suited to potatoes, peas, oats, grasses, and legumes. Capability unit IIe-3.

Caribou gravelly loam, 8 to 15 percent slopes (CgC).—Where forested, this soil has a profile similar to that described for the forested Caribou gravelly loam, 2 to 8 percent slopes. This profile in cultivated areas is similar to the profile given under the description of the Caribou series.

Caribou gravelly loam, 8 to 15 percent slopes, is mainly on the sides of ridges, and most slopes are only 400 to 600 feet long. Much of this soil occurs below Caribou gravelly loam, 2 to 8 percent slopes, and extends to soils on glacial outwash, soils on stream terraces, or soils on bottom lands, or to a small brook or swampy area. A few areas of Caribou gravelly loam, 8 to 15 percent slopes, are 4 or 5 acres in size and are surrounded by less sloping Caribou soils.

The A′2 horizon is generally only 10 to 12 inches below the surface; this is because of loss of soil through erosion or because the horizons above the A′2 are thinner than normal. Since the present plow layer and subsoil are friable, the areas of shallower soil are used and managed in a way similar to that practiced on areas of deeper soil.

Roots, especially those of deep-rooted plants, extend into the substratum. The water table is below a depth of 5 feet during most of the year because water moves both vertically and horizontally in the soil.

This soil has been used intensively for potatoes and has received large applications of fertilizer, but in most places it does not have so large a supply of available plant nutrients as Caribou gravelly loam, 2 to 8 percent slopes.

In some places Caribou gravelly loam, 8 to 15 percent slopes, receives additional water from higher lying soils. Surface runoff is moderately rapid and often results in loss of soil. Properly placed diversion ditches will limit erosion. Contour stripcropping helps to conserve soil, water, and available plant nutrients.

The soil and climate are well suited to the growing of potatoes, peas, oats, grasses, and legumes. Capability unit IIIe-3.

Caribou gravelly loam, 15 to 25 percent slopes (CgD).—In some areas this soil is forested and has A1, A2, and B21 horizons similar to those in Caribou gravelly loam, 2 to 8 percent slopes. Below a depth of 9 inches, these forested areas have a profile similar to that given in the series description. Where the soil is cultivated, the entire profile is like that described for the series.

Included with this soil is a soil that has more gravel in the subsoil and substratum. This included soil generally occurs just above narrow stream valleys. Also, in a few areas, there is an included soil that has more shale fragments in the plow layer. In such areas the soil is thinner than normal to the firm substratum. The included soils are used and managed in much the same way as the normal soil.

Caribou gravelly loam, 15 to 25 percent slopes, has moderate to moderately rapid permeability and rapid surface runoff. In some places it is slightly droughty. Roots, especially those of trees and deep-rooted legumes, extend to a depth of 4 or 5 feet. Unless protected by permanent vegetation, the soil will erode. When the soil is used for cultivated crops, it needs to be farmed in graded strips on the contour. Diversion ditches will limit loss of soil.

This soil is usually low in plant nutrients, but it responds well to large applications of fertilizer. It is well suited to grasses and legumes and can be used for potatoes and oats. Capability unit IVe-3.

Caribou gravelly loam, 25 to 45 percent slopes (CgE).—In some areas this soil is forested. Except for thinner horizons and a slightly higher percentage of gravel, the profile is similar to that of the forested Caribou gravelly loam, 2 to 8 percent slopes. The nonwooded soil has a profile similar to the one given in the series description.

Caribou gravelly loam, 25 to 45 percent slopes, has short, steep slopes and occurs mainly on ridges above streams and on abrupt breaks next to river terraces. The surface layer and subsoil are generally 20 to 30 percent gravel, and the substratum is 40 to 50 percent gravel. Permeability of the surface layer and subsoil is moderate. Surface runoff is rapid. In summer only a small amount of rainfall enters the soil. Roots of most plants penetrate the subsoil, and those of deep-rooted legumes and trees penetrate the substratum. The subsoil is usually neutral in reaction, and the substratum is alkaline. There is a large amount of available calcium in the subsoil. The content of plant nutrients in the surface layer is variable.

This soil is well suited to early summer pasture, but it may not contain enough moisture to produce high yields of grasses and legumes late in summer. Capability unit VIe-3.

Colton Series

The soils of the Colton series are somewhat excessively drained gravelly sandy loams on sandy and gravelly material that was deposited by water. They have a gravelly sandy loam or sandy loam surface horizon and a thin gravelly sandy loam or gravelly loamy sand subsoil. Below a depth of 12 to 15 inches, these soils are gravelly loamy sand or sand and gravel, and more than 50 percent of this material is the size of gravel or larger.

In the northeastern part of the survey area, the Colton soils contain fragments of weathered limestone, as well as fragments of shale, slate, and sandstone. In the other

parts of the area, they contain a few limestone fragments. In most areas these soils are acid, but where they occur close to the Caribou soils, their subsoil is often neutral.

The Colton soils are on eskers, kames, esker-deltas, and terraces in association with the moderately well drained Machias, poorly drained Red Hook, and very poorly drained Atherton soils.

The Colton soils developed under a cover of pine and northern hardwoods.

Representative profile—Colton gravelly sandy loam, dark materials, 2 to 8 percent slopes (cultivated):

Ap—0 to 8 inches, dark-brown (10YR 4/3) gravelly sandy loam; weak, medium, granular structure; very friable; abrupt, smooth boundary; 5 to 9 inches thick.

B21—8 to 16 inches, strong-brown (7.5YR 5/8) gravelly loamy sand; weak, fine, granular structure; loose; abrupt, smooth boundary; 6 to 10 inches thick.

B22u—16 to 21 inches, yellowish-brown (10YR 5/6) gravelly loamy sand; single grain (structureless); loose; 50 to 60 percent of mass is gravel; abrupt, smooth boundary; 3 to 6 inches thick.

D—21 to 30 inches, speckled strong-brown (7.5YR 5/6) and grayish-brown (2.5Y 5/2) sand and gravel; stratified; single grain (structureless); loose.

Colton gravelly sandy loam, dark materials, 0 to 2 percent slopes (CnA).—This soil is on nearly level terraces and contains more sand and less gravel than other soils of the Colton series. Normally, the subsoil is gravelly sandy loam, whereas the subsoil in the profile described for the series is gravelly loamy sand. The top 15 to 18 inches of soil has moderate water-holding capacity, but below this depth the soil has low water-holding capacity. This soil is slightly droughty and needs to be irrigated to produce high yields of crops. It can be used for potatoes, followed by a green-manure crop, with but little loss of soil. Capability unit IIs-5.

Colton gravelly sandy loam, dark materials, 2 to 8 percent slopes (CnB).—Most of this soil is on undulating esker-deltas or on the rounded tops of eskers. A profile of the soil is described as representative for the series. The top 12 to 15 inches of soil has moderate water-holding capacity but does not hold enough water to keep crops growing satisfactorily during dry periods. Below a depth of 15 inches, the soil is normally gravelly loamy sand that has low water-holding capacity.

This soil is used for potatoes and grass-legume hay crops. Yields are generally low, unless a high content of organic matter is maintained. This can often be done through the growing of green-manure crops. In many places irrigation will improve yields of crops. Capability unit IIs-5.

Colton gravelly sandy loam, dark materials, 8 to 15 percent slopes (CnC).—This soil is on the sides of eskers and kames and on outwash deposits on the sides of till ridges. Except on steeper slopes, the profile generally resembles that described as representative for the series. On the sides of till ridges, the soil contains some angular stones, generally has a higher percentage of sand and silt, and, in many places, has some characteristics similar to those of soils derived from till. The water-holding capacity of this soil varies. Where it contains angular rock fragments, the soil has a slightly higher water-holding capacity than where it contains only subrounded fragments.

Potatoes can be grown in a rotation with oats and hay. Since this soil has only moderate to moderately low water-holding capacity, a high content of organic matter should be maintained. Most of the rainfall can be held on the soil through the use of contour stripcropping. On some long slopes, diversion ditches will help to control runoff and to limit loss of soil. Capability unit IIIes-5.

Colton gravelly sandy loam, dark materials, 15 to 25 percent slopes (CnD).—Most of this soil is on the sides of eskers and kames. It has steep, irregular slopes. Normally, it is made up of only 10 or 12 inches of gravelly sandy loam over coarse gravelly loamy sand.

The soil is friable or loose, so water easily penetrates it, but the slopes are so steep that much of the water runs off before it can enter the soil. This soil has low water-holding capacity and is droughty. In other respects it resembles the representative soil described for the series.

The areas can be used for permanent hay. Deep-rooted legumes often yield better than shallow-rooted grasses. In many places the substratum contains available lime, but the plow layer is usually acid. Consequently, large applications of lime and fertilizer are needed until plants become established. When this soil is used for a row crop, contour stripcropping and diversion ditches help to conserve water and to limit loss of soil. Capability unit IVes-5.

Colton gravelly sandy loam, dark materials, 25 to 45 percent slopes (CnE).—This soil is mostly on terrace faces. It has short, steep slopes, mainly less than 45 percent. Some slopes of 75 percent occur, however. The soil has low water-holding capacity because the texture is normally coarse gravelly loamy sand below a depth of 12 inches. Surface runoff is rapid, except where the soil has a good cover of vegetation. This soil is very difficult to manage, unless it is used for forestry. In most places it is forested with pine, hardwoods, and some fir trees. Roads are difficult to establish, but the soil is a good source of gravel for use in building roads on other soils. Capability unit VIIes-5.

Conant Series

The Conant series is made up of moderately well drained, medium-textured soils on firm, calcareous glacial till of Wisconsin age. Except for the silt loam plow layer, the soil material and underlying till are loam. These soils are firm or very firm at a depth of about 18 inches and have a slight accumulation of fine clay in the subsoil. The Conant soils have bisequal profiles. The lower B′ horizons are firm or massive and are not friable like the upper B horizon.

The Conant soils are common in the northeastern corner of the survey area, where they are associated with the well-drained Caribou soils. They also occur in the towns of Ludlow, Linneus, and New Limerick in association with the well-drained Linneus soils. Although the Conant soils are similar to the Howland soils in natural drainage, their subsoil is not so firm and the underlying firm layer is not so close to the surface. In some of the slowly drained areas, the Conant soils are similar to the Daigle soils, except that the Daigle have a subsoil of very firm clay loam.

The Conant soils developed under mixed forests of northern hardwoods, spruce, and fir.

In the survey area, the Conant soils contain fewer stones than any other moderately well drained soils derived from glacial till. A few stones are on the surface and in the

subsoil, however. In noncultivated areas, shale fragments, 10 to 18 inches in diameter, occur on the surface at intervals of about 75 to 100 feet. Each time the soils are plowed, a few stones per acre are brought to the surface.

Representative profile—Conant silt loam, 2 to 8 percent slopes (cultivated):

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; very friable; abrupt, smooth boundary; 8 to 10 inches thick.

B2—8 to 12 inches, dark-brown (7.5YR 4/4) loam; weak, medium, granular structure; very friable; abrupt, wavy boundary; 2 to 4 inches thick.

A′2g—12 to 18 inches, light olive-brown (2.5Y 5/6) loam; few, fine, olive-gray mottles; weak, thin, platy structure; friable; clear irregular boundary; 4 to 6 inches thick.

B′21gm—18 to 26 inches, olive-brown (2.5Y 4/4) loam with many, coarse, grayish-brown and few, fine, yellowish-brown mottles; weak, very coarse, prismatic structure and moderately coarse, subangular blocky; very firm in place; clay films on peds; pH 5.7; clear, wavy boundary; 6 to 10 inches thick.

B′22gm—26 to 50 inches, about the same as horizon above, but less evidence of prisms and 10 to 30 percent of mass is partly weathered shale fragments; less firm below 42 inches, and massive; pH 7.0; 20 to 30 inches thick.

C1—50 inches +, light olive-brown (2.5Y 5/4) gravelly loam till; platy structure or massive; very firm; clay films on top of shale fragments; calcareous.

Conant silt loam, 0 to 2 percent slopes (CoA).—Where cultivated, this nearly level soil has a plow layer of dark grayish-brown silt loam, 10 to 12 inches thick. In other respects the soil has a profile similar to the representative profile described for the series. Some of this soil has remained in forest. In such areas the soil has a profile similar to the profile described for the forested Conant silt loam, 2 to 8 percent slopes.

Conant silt loam, 0 to 2 percent slopes, is in slight depressions. Because water is held close to the surface by a firm layer, the soil is seldom well suited to farming before the first of June. Surface runoff is slow, but the soil responds to artificial drainage. If suitable outlets are available, either tile or open ditches will remove most of the surface and subsurface moisture.

The soil can be used for hay, pasture, and oats without artificial drainage, but in some years winterkilling of grasses and clovers is severe. Potatoes are grown in undrained fields, but high yields can be obtained more consistently after drainage has been improved. Capability unit IIw–4.

Conant silt loam, 2 to 8 percent slopes (CoB).—Most of this gently sloping soil is cultivated, but several thousand acres are forested. Where forested, the soil has a thin A1 horizon and a grayish-brown silt loam A2 horizon, about 3 inches thick. Below this is a dark-brown silt loam B21 horizon, 2 to 5 inches thick. Below a depth of about 8 inches, the profiles of the forested soil and the cultivated soil are similar.

This soil can be used for hay or pasture because grasses and clovers usually produce good yields without artificial drainage. In dry years it can be used for potatoes. Higher yields of all crops can be obtained if the fields are drained. Fieldwork is often delayed until late in spring because the soil is wet. The soil can be drained with tile, which is fairly easy to install. Some stones occur in the subsoil. Few of them are more than 2 feet in diameter, so they generally can be easily removed. On long slopes the soil should be farmed in graded strips to limit erosion.

Forests contain mainly spruce, fir, and a few northern hardwoods. Spruce grows well. Lumbering can be done easily in summer or winter. Logging roads that are to be used in spring and fall need drains and surface grading. Capability unit IIw–4.

Conant silt loam, 8 to 15 percent slopes (CoC).—About half of this moderately steep soil is cultivated, and half is forested. The soil occurs in seepage areas on the sides of hills.

Where forested, the soil has a thin A1 horizon over a grayish-brown silt loam A2 horizon, about 3 inches thick. Under this is a dark-brown silt loam B21 horizon, 2 to 5 inches thick. Below a depth of about 8 inches, the profiles of the forested soil and the cultivated soil are similar.

Included with this soil in mapping is a soil that has slopes of slightly more than 15 percent but that responds to similar use and management. Where cultivated, it has a profile similar to that described as representative of the series.

Conant silt loam, 8 to 15 percent slopes, can be used for hay or pasture, and it produces good yields of grasses and clovers if limed and fertilized. Unless the soil is drained, potatoes can seldom be planted until late in spring. If used in a regular rotation that includes potatoes, the soil should be farmed in graded strips that have diversion ditches. This will limit loss of soil and help to remove excess water from the surface and subsoil. Wet spots can be drained with tile.

Forests contain mainly spruce, fir, and a few northern hardwoods. Spruce grows well. Lumbering can be done easily in summer or winter. Logging roads that are to be used in spring and fall need drains and surface grading. Capability unit IIIew–4.

Daigle Series

The Daigle series consists of somewhat poorly drained, medium-textured soils on firm, neutral till of Wisconsin age. The till was derived mainly from shale, slate, and phyllite. It is normally 3 to 5 feet thick over shale bedrock that occurs in nearly vertical beds. The Daigle soils have bisequal profiles that consist of a Podzol over a soil that resembles the Gray-Brown Podzolic soils. They occur in depressions next to areas of the Perham soils.

Where cultivated, the Daigle soils have a plow layer of dark grayish-brown silt loam that consists of a mixture of the original A0, A1, A2, and B2g horizons. Where forested, the soils have irregular microrelief made up of mounds and depressions. This type of relief is not so pronounced as on the poorly drained soils, but it has influenced the color of the soils that are presently cultivated. Only a few stones are in the forests. Angular shale fragments, up to 18 inches long, occur at intervals of 75 to 100 feet.

At a depth of about 12 to 18 inches, or in the A′2g horizon, there are many angular shale fragments. This horizon is so stony that it is difficult to remove in digging a pit. Once it is removed, however, deeper excavation is less difficult. The A′2g horizon divides the upper B horizon, which consists of loam, from the lower B′g horizons, which consist of clay loam. The B′g horizons are very dark brown to dark brown and have subangular blocky structure and clay films on the peds. In many places these horizons are brittle and very firm and have manganese and organic stains around the pores.

In some places the solum extends to bedrock and the soils do not have a C horizon. Where there is less than about 4 feet of soil over bedrock, the gray, shattered shale, which occurs in vertical beds, has silt and clay between the seams. Where the soils are more than 4 feet to bedrock, they have a C1g horizon of weakly mottled, very firm silt loam or clay loam.

The Daigle soils developed under mixed northern hardwoods and spruce-fir forests.

Representative profile—Daigle silt loam, 2 to 8 percent slopes (cultivated):

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; pH 5.2; abrupt, smooth boundary; 7 to 10 inches thick.

B2g—7 to 12 inches, dark-brown (10YR 4/3) loam with few, fine, grayish-brown and yellowish-brown mottles; weak, medium, granular structure; friable; pH 5.5; clear, wavy boundary; 2 to 8 inches thick.

A'2g—12 to 18 inches, grayish-brown (2.5Y 5/2) loam with many, medium, grayish-brown and dark grayish-brown mottles; weak, thin, platy structure; firm; pH 5.2; 20 to 30 percent of mass is coarse fragments; clear, wavy boundary; 2 to 10 inches thick.

B'21gm—18 to 24 inches, dark grayish-brown (10YR 4/2) clay loam with fine, grayish-brown mottles; subangular blocky structure; very firm and brittle; films of silt and clay on tops and sides of peds; pH 6.0; clear, wavy boundary; 6 to 10 inches thick.

B'22g—24 to 45 inches, dark-brown (10YR 4/3) clay loam with few, fine, grayish-brown mottles; moderate, fine, subangular blocky structure; very firm; few, thin films of silt and clay around pores; pH 6.5; clear, wavy boundary; 10 to 20 inches thick.

C1g—45 to 48 inches, dark-brown (10YR 4/3) clay loam with few, fine, grayish-brown mottles; moderate, fine, subangular blocky structure that grades to massive in lower part; very firm, sticky; 30 to 40 percent of mass is coarse fragments; pH 7.2.

Daigle silt loam, 0 to 2 percent slopes (DaA).—Where this nearly level soil has received deposits washed from higher areas, the surface layer is 10 to 12 inches thick. In other respects the profile is like that described as representative of the series.

This soil can be used for hay or pasture, and if limed and fertilized, it produces good yields of grasses and legumes. Open drains will remove excess surface water so that the soil warms up earlier in spring. The areas can then be used for potatoes, though high yields cannot be obtained consistently. The soil can be drained with tile, but the subsoil is heavy and drains slowly. If properly drained, this soil can be used intensively for potatoes with but little damage through erosion. Because it occurs in areas where dairy cattle are raised, the soil is used mainly for hay. An occasional crop of potatoes or oats is grown in fields that have some surface drainage. Capability unit IIw–4.

Daigle silt loam, 2 to 8 percent slopes (DaB).—Most of this gently sloping soil is cultivated. It has a profile like that described as representative of the series. Where forested, the soil has a surface layer of organic matter, 3 to 4 inches thick, over a thin, discontinuous, nearly black A1 horizon. Below these horizons is a grayish-brown silt loam A2 horizon, about 3 inches thick, underlain by a brown silt loam B21 horizon, also about 3 inches thick. Below a depth of 8 inches, the profile of the forested soil is like that of the cultivated soil.

On the surface of forested areas, there are stones, 6 to 18 inches in diameter, at intervals of 75 to 100 feet. Whenever fields are plowed, a few stones per acre are brought to the surface. Permeability is slow, but surface runoff is medium, and for this reason, water seldom stands on the surface.

Included with this soil are areas of a somewhat better drained soil.

Daigle silt loam, 2 to 8 percent slopes, produces good yields of grasses and legumes and can be used for hay or pasture. If used for potatoes, it should be drained. Diversion ditches will remove most of the water from the surface and subsurface. Tile drains can be used, but the subsoil is fine textured, and water moves slowly to the tile. If the soil is properly drained, good yields of potatoes, oats, grasses, and clovers can be obtained. Long slopes should be farmed in graded strips to limit loss of soil.

The forests consist mainly of spruce, fir, maple, and birch. Spruce grows well and can be encouraged to predominate on this soil. Lumbering can be done easily in summer or winter. Farm roads that are to be used in spring and fall need drains and surface grading. Capability unit IIw–4.

Daigle silt loam, 8 to 15 percent slopes (DaC).—Most of this moderately steep soil is cultivated, and the profile is like that described as representative of the series. Where forested, the soil has a layer of organic matter, 2 to 3 inches thick, over a thin, discontinuous, nearly black A1 horizon. Below these horizons is a grayish-brown silt loam A2 horizon, about 2 inches thick, underlain by a brown silt loam B21 horizon, about 3 inches thick. Below a depth of about 8 inches, the profiles of the forested soil and the cultivated soil are similar.

On the surface of forested areas, there are stones, about 6 to 13 inches in diameter, at intervals of 75 to 100 feet. Whenever the soil is plowed, a few stones per acre are brought to the surface. Permeability is slow, but surface runoff is medium to rapid, and for this reason, water seldom stands on the surface.

Included with this soil are areas of a moderately well drained soil.

Daigle silt loam, 8 to 15 percent slopes, produces good yields of grasses and legumes and can be used for hay or pasture. If used for potatoes, it should be drained. Diversion ditches will remove most of the water from the surface and subsurface. Tile drains can be used, but the subsoil is fine textured, and water moves slowly to the tile. If the soil is properly drained, good yields of potatoes, oats, grasses, and clovers can be obtained. Long slopes should be farmed in graded strips to limit loss of soil.

The forests consist mainly of spruce, fir, maple, and birch. Spruce grows well and can be encouraged to predominate on this soil. Lumbering can be done easily in summer or winter. Farm roads that are to be used in spring and fall need drains and surface grading. Capability unit IIIew–4.

Hadley Series

In the Hadley series are well-drained soils that developed on medium-textured sediments deposited by streams. The sediments were derived mainly from shale or slate. The areas are narrow and are only a few feet above streams, but they seldom are flooded.

In most places, the profile consists of silt loam to a depth of 30 inches, but in some places the lower C horizon is fine sandy loam.

The Hadley soils are closely associated with the moderately well drained Winooski soils, which are in slight depressions and consist of alluvial deposits.

Most of the acreage of Hadley soils has been cleared, but there are a few forests of spruce, fir, pine, and some northern hardwoods. Except that they occur as small, narrow bands, the soils are easy to farm.

Representative profile—Hadley silt loam (cultivated):

Ap—0 to 10 inches, light olive-brown (2.5Y 5/4) silt loam; weak, fine, granular structure; friable; strongly acid; abrupt, smooth boundary; 8 to 10 inches thick.

C1—10 to 15 inches, light olive-brown (2.5Y 5/6) silt loam; weak, fine, granular structure; friable; strongly acid; abrupt, smooth boundary; 5 to 12 inches thick.

C2—15 to 36 inches, grayish-brown (2.5Y 5/2) silt loam; weak, fine, granular structure; very friable to loose; medium acid.

Hadley silt loam (Ha).—This soil—the only member of the Hadley series in Southern Aroostook County—occurs on nearly level bottom lands. In places the texture of the soil varies from that given for the representative profile. It ranges from silt loam to very fine sandy loam because the parent material has been deposited as layers of silt and fine sand and is seldom uniform over a large area.

The areas of silt loam and fine sandy loam soil differ little in use or in yields of crops. Therefore, they have been mapped as silt loam. There are some variations in pH, but the soil is normally acid to a depth of 30 inches. The soil particles are fine and are easily compacted. This results in slow permeability in the upper part of the soil and causes water to stand between the rows of cultivated crops.

If fertility and the content of organic matter are maintained, this soil can be used intensively for cultivated crops. At present, it is used for potatoes grown in a rotation with oats and hay. Capability unit IIc–6.

Howland Series

The Howland series is made up of moderately well drained to somewhat poorly drained soils on acid glacial till that consists of firm gravelly loam. The till was derived mainly from shale, slate, and sandstone. The soils have a firm subsoil. They are common throughout the survey area, except in the northeastern part.

Where forested, the soils have a thin A1 horizon over a grayish-brown A2 horizon, 3 to 4 inches thick. The upper B horizon is mottled brown, yellowish-brown, and grayish-brown, friable gravelly loam.

Where cultivated, the soils have a dark grayish-brown or very dark grayish-brown Ap horizon. The variation in color probably results from difference in drainage in the soils, but some variation is the result of the leveling of mounds.

Forested areas are generally stony. Where the stones have been removed and the soils have been plowed and leveled, there are pockets consisting of A2 and B21g horizons. In some spots the A2 is buried below the B21g horizon.

Somewhat poorly drained areas of these soils are as wet as the Daigle soils, which, unlike the Howland soils, have a bisequal profile and have B horizons consisting of mottled clay loam.

The Howland soils are members of the same catena as the well-drained Plaisted, poorly drained Monarda, and very poorly drained Burnham soils.

The Howland soils developed under forests of mixed hardwoods and softwoods.

Representative profile—Howland gravelly loam, 2 to 8 percent slopes (cultivated):

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) gravelly loam; moderate, medium, granular structure; friable; 20 to 30 percent of mass is coarse fragments; strongly acid; abrupt, smooth boundary; 5 to 10 inches thick.

B21—6 to 8 inches, dark-brown (7.5YR 4/4) gravelly loam; weak, fine, granular structure; friable; 20 to 30 percent of mass is coarse fragments; strongly acid; clear, wavy boundary; 2 to 6 inches thick.

B22—8 to 14 inches, dark yellowish-brown (10YR 4/4) gravelly loam; weak, fine, granular structure; friable; 20 to 30 percent of mass is coarse fragments; medium acid; clear, wavy boundary; 4 to 8 inches thick.

B3gm—14 to 23 inches, light olive-brown (2.5Y 5/6) gravelly loam with common, medium, distinct grayish-brown and yellowish-brown mottles; moderate, medium, platy structure; firm, brittle when dry; 25 to 30 percent of mass is coarse fragments; medium acid; clear, wavy boundary; 5 to 10 inches thick.

Cgm—23 to 30 inches +, light olive-brown (2.5Y 5/4) gravelly loam with few, fine, faint, grayish-brown mottles; massive; firm to very firm; 25 to 30 percent of mass is coarse fragments; medium acid.

Howland gravelly loam, 0 to 2 percent slopes (HoA).—Most of this nearly level soil is cultivated, but some of it is forested. Where cultivated, the soil has a surface layer made up of 10 to 12 inches of very dark grayish-brown gravelly loam. Otherwise, the profile is like that described as representative of the series.

Where forested, the soil has a surface layer of organic matter, 3 to 4 inches thick, over a thin, nearly black A1 horizon. Below this is a grayish-brown gravelly loam A2 horizon, about 2 to 4 inches thick. The A2 horizon is underlain by a B21 horizon, 4 to 6 inches thick. The profile of the forested soil has a thicker B21 horizon than that of the cultivated soil, but in other respects this horizon and the underlying horizons are similar to those of the profile of the cultivated soil.

Where forested, the soil has stones, about 6 to 24 inches in diameter, on the surface at intervals of 150 to 175 feet. Each time a cultivated field is plowed, a few stones per acre are brought to the surface.

A firm layer below a depth of 15 inches limits the penetration of water and roots. Permeability is moderately slow, and water often stands on the surface in spring and fall. Most of the water can be removed from the upper part of the soil by tile or by open drains, but, even then, roots will seldom penetrate the firm subsoil. Good yields of grasses and clovers can be obtained in undrained areas, but, after drainage improvement, uniform stands can be maintained over a longer period. Good yields of potatoes and oats can be obtained in drained areas. In some undrained places, yields of potatoes are fair, but, after being drained, the soil can be worked earlier in spring and will produce consistently higher yields.

The forests consist mainly of spruce, fir, maple, and birch. Spruce grows well on this soil. Capability unit IIw–4.

Howland gravelly loam, 2 to 8 percent slopes (HoB).—Much of this gently sloping soil is cultivated, but some of it is forested. A profile of cultivated soil is described as representative of the series.

Where forested, the soil has a surface layer of organic matter, 2 to 3 inches thick, over a thin, nearly black A1 horizon. Below this is a grayish-brown gravelly loam A2 horizon, about 2 to 4 inches thick. The A2 horizon is underlain by a B21 horizon, 5 to 8 inches thick. The profile of the forested soil has a thicker B21 horizon than that of the cultivated soil, but in other respects this horizon and the underlying horizons are similar to those of the cultivated soil.

In the forests, stones about 6 inches to 24 inches in diameter are on the surface at intervals of 150 to 175 feet. Each time a cultivated field is plowed, a few stones per acre are brought to the surface.

Surface runoff is medium, so water seldom stands on the surface. Permeability is moderately slow, and a firm layer below a depth of 15 inches holds water in the upper part of the soil during spring and fall. Most of the excess water can be removed through tile or diversion ditches. Even after drainage has been improved, roots penetrate only the top 12 to 15 inches of soil.

The soil can be used for hay or pasture, and yields are good, even in undrained areas. More uniform stands of forage plants can be maintained after the soil has been drained, however. In some undrained fields, good yields of potatoes and oats are obtained. After having been drained, the soil can be farmed earlier in spring and it will produce higher yields more consistently.

The forests are made up mainly of spruce, fir, beech, birch, and maple. Spruce grows well and, through selective cutting, can be encouraged to predominate on this soil. Lumbering can be done easily in summer or winter. Logging roads that are to be used in spring and fall need drains and surface grading. Capability unit IIw–4.

Howland gravelly loam, 8 to 15 percent slopes (HoC).—Most of this soil is moderately steep, and some of it has slopes of more than 15 percent. The soil occurs in seepage areas on the sides of hills. Most of it is forested, but some is cultivated. The profile of the cultivated soil is similar to that described as representative of the series, except that in some places the soil is friable to a depth of 15 to 18 inches.

Where forested, the soil has a surface layer of organic material, about 2 inches thick, over a grayish-brown A2 horizon, about 1 to 3 inches thick. The A2 horizon is underlain by a B21 horizon, 5 to 8 inches thick. The profile of the forested soil has a thicker B21 horizon than that of the cultivated soil, but in other respects this horizon and the underlying horizons are similar to those of the cultivated soil. In the forests, stones, about 6 to 24 inches in diameter, are on the surface at intervals of 150 to 175 feet. Each time a cultivated field is plowed, a few stones per acre are brought to the surface.

This soil produces good yields of clovers and grasses. It can be used for permanent hay or pasture if moderate amounts of lime and fertilizer are applied. If used in the usual rotation that includes potatoes, the soil should be farmed in graded strips that have diversion ditches. The bottom of the diversion ditch should be in the firm subsoil so it can collect the subsoil water that seeps downslope above this layer. The soil in the bottom of the ditch is firm, acid, and low in plant nutrients; consequently, it should be loosened, limed, and fertilized before being seeded.

The forests are made up mainly of mixed northern hardwoods, spruce, and fir. Lumbering can be done easily in summer and winter. Logging roads that are to be used in spring and fall need drains and surface grading. Capability unit IIIew–4.

Howland very stony loam, 0 to 8 percent slopes (HvB).—This gently undulating to gently sloping soil occurs on low hills and in depressions on the tops of large ridges. Most of it is forested. Because of the windthrow of trees, the relief is irregular. Mounds, 1 to 3 feet high, are surrounded by concave areas. Except that the surface layer is made up of very stony loam, the profile of this soil is similar to that described as representative of the series.

Loose stones, 10 to 15 inches in diameter, are scattered over the surface of this soil at intervals of 5 to 10 feet. In some places granite stones, 3 to 4 feet in diameter, are partly embedded in the soil at intervals of about 25 feet.

This soil has never been cleared. It has mixed stands of spruce, fir, cedar, maple, beech, and birch. The forests are productive and can be converted to, or maintained in, a spruce-fir type of cover. Logging roads to be used in summer are easy to build and to maintain, but year-round roads need drains. Capability unit VIs–3.

Howland very stony loam, 8 to 15 percent slopes (HvC).—This soil is on the sides of glacial till ridges. It occurs in seepage areas that have resulted from springs or a perched water table. Water is held near the surface of the soil by the very compact substratum and subsoil. Most of the soil has slopes of less than 15 percent, but some of it has slightly stronger slopes. Except that the surface layer consists of very stony loam, the profile of this soil is similar to that described as representative of the series.

Loose stones, 10 to 15 inches in diameter, are scattered over the surface of this soil at intervals of 5 to 10 feet. In some places granite stones, 3 to 4 feet in diameter, are partly embedded in the soil at intervals of about 25 feet.

Nearly all of this soil is used for forestry. It has never been cleared but has been left to produce a mixed stand of softwoods and hardwoods consisting of spruce, fir, cedar, hemlock, maple, beech, and birch. By selective cutting, spruce and fir can be encouraged to predominate. Logging roads to be used in summer are easy to build and maintain. Surface drainage and grading are necessary to maintain year-round logging roads. Capability unit VIs–3.

Linneus Series

The Linneus series is made up of well-drained, medium-textured soils on olive-gray glacial till of Wisconsin age. The till was derived from dark-gray limestone and calcareous shale. The Linneus soils occur on gently rolling ridges in the towns of Linneus, New Limerick, and Ludlow. Geographically, they are associated with the Caribou and Conant soils.

Where forested, the Linneus soils have a very dark grayish-brown A1 horizon, 2 to 8 inches thick, that is more than 50 percent silt. In some places there are traces of a grayish-brown A2 horizon. The lower part of the B horizon is generally 60 to 70 percent silt. The color of the B

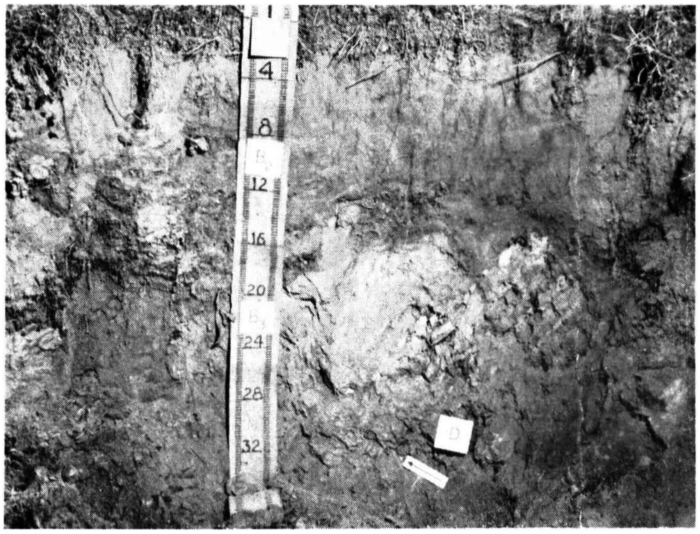

Figure 4.—**Profile of Linneus silt loam. Depth to bedrock (Dr horizon) is variable.**

horizon grades slightly, with increasing depth, from dark yellowish brown to olive brown. About 10 percent or less of the soil material is coarse fragments. Limestone fragments are on the surface.

Where cultivated, the soils have a dark-gray or dark grayish-brown silt loam Ap horizon, 7 to 12 inches thick. The depth to bedrock is very irregular (fig. 4), and in some places the bedrock is exposed. Where they are less than 24 inches deep, the soils do not have a C horizon but have yellowish-brown and olive-brown B horizons.

The Linneus soils developed under forests of northern hardwoods, spruce, and fir. The nearly level to gently rolling areas are used for crops. Some areas are moderately steep and are still in forests.

Representative profile—Linneus silt loam, 0 to 8 percent slopes (forested):

A0—2 inches to 0, very dark grayish-brown, partly decomposed organic matter; 1 to 2 inches thick.

A1—0 to 6 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, granular structure; friable; pH 5.4; 10 percent of mass is coarse fragments; abrupt, smooth boundary; 2 to 8 inches thick.

B21—6 to 12 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine, granular structure; friable; pH 5.6; 10 percent of mass is coarse fragments; abrupt, smooth boundary; 4 to 8 inches thick.

B22—12 to 19 inches, yellowish-brown (10YR 5/6) silt loam; weak, fine, granular structure; friable; pH 5.8; 5 percent of mass is coarse fragments; abrupt, wavy boundary; 5 to 10 inches thick.

B3—19 to 23 inches, olive-brown (2.5Y 4/4) silt loam; weak, fine, granular structure; friable; pH 5.8; 10 percent of mass is coarse fragments; clear, wavy boundary; 2 to 6 inches thick.

C1—23 to 32 inches, olive (5Y 4/3) silt loam; weak, thin, platy structure; friable; pH 5.8 to 6.2; black and brown "ghosts"; 10 percent of mass is coarse fragments.

Dr—32 inches +, calcareous, dark-gray limestone bedrock.

Linneus silt loam, 0 to 8 percent slopes (LnB).—This soil has irregular, gently rolling relief which is influenced by the underlying bedrock. The depth to bedrock varies but is generally more than 24 inches. In places limestone fragments occur on the surface, but in only a few places are there other kinds of fragments on or in the soil. A profile of this soil is described as representative of the series.

Linneus silt loam, 0 to 8 percent slopes, has the largest acreage of the Linneus soils in Southern Aroostook County, and a greater proportion of it is cultivated. Most of this soil is used in a rotation that includes potatoes. The soil is fairly easy to farm, but erosion is a hazard. Most of the soil is composed of silt-sized particles that are easily moved by runoff. Contour stripcropping helps to control erosion on the more uniform slopes. Fields that have irregular relief can be farmed in a long rotation, and crops should be planted across the slope. Capability unit IIe-3.

Linneus silt loam, 8 to 15 percent slopes (LnC).—This soil is on the sloping sides of ridges of olive-gray limestone till. Its profile is similar to the profile described as representative of the series.

In many places this soil is deeper than the Linneus soils of the gently rolling ridgetops. In some places, however, it has lost some of the till through geological erosion. Here, the soil has a distinct dark-gray Ap horizon, and the entire profile is so highly shaded with dark gray that it is difficult to distinguish the A horizon from the B and C horizons. Limestone and shale fragments that are partly weathered and are easily broken occur in this soil. There are few other kinds of fragments.

Potatoes are generally grown on the soil as part of a long rotation that includes oats and a grass-legume mixture. Because this silty soil is erodible, it should be farmed on the contour. Contour stripcropping helps to conserve water and to reduce erosion on most slopes. Where the soil is uniformly moderately deep, diversion ditches will also help to control runoff and erosion. Capability unit IIIe-3.

Linneus silt loam, 15 to 35 percent slopes (LnD).—This moderately steep soil is the least extensive of the Linneus soils. It is shallow in many spots. Most of it is forested and has a profile similar to that described as representative of the series. Where cultivated, the soil has a dark grayish-brown silt loam Ap horizon, 7 to 9 inches thick.

This soil can be used for potatoes, but they should be grown as part of a long rotation. Contour stripcropping limits erosion on long slopes and helps to conserve rainfall. Because of the steep, irregular relief, the soil is difficult to manage. It is more easily managed when used for hay or pasture than when used for cultivated crops. Capability unit IVe-3.

Machias Series

The Machias series is made up of moderately well drained soils on sandy and gravelly glacial outwash. These soils have a gravelly loam surface layer and a gravelly loam or gravelly silt loam subsoil. They are underlain at a depth of about 30 inches by stratified sand and gravel. The Machias soils are in depressions on esker-deltas and terraces in association with the well-drained Stetson, somewhat excessively drained Colton, poorly drained Red Hook, and very poorly drained Atherton soils. The parent material of the Machias soils, and that of the associated soils, was derived from shale, slate, sandstone, and limestone.

The Machias soils developed under a cover of maple, beech, birch, pine, spruce, and fir.

Representative profile—Machias gravelly loam, 0 to 2 percent slopes (cultivated):

Ap—0 to 11 inches, dark grayish-brown (10YR 4/2) gravelly loam; weak, fine, granular structure; friable; strongly acid; abrupt, smooth boundary; 6 to 12 inches thick.

B21—11 to 16 inches, light olive-brown (2.5Y 5/6) gravelly loam; weak, fine, granular structure; friable; strongly acid; clear, wavy boundary; 3 to 6 inches thick.

B21g—16 to 22 inches, light olive-brown (2.5Y 5/4) gravelly loam; many, distinct, grayish-brown and yellowish-brown mottles; weak, fine, granular structure; friable; strongly acid; clear, wavy boundary; 4 to 8 inches thick.

B22g—22 to 30 inches, light olive-brown (2.5Y 5/4) gravelly loam with many, distinct, grayish-brown and yellowish-brown mottles; weak, fine, granular structure; friable; medium acid; 20 to 30 percent of mass is gravel; clear, wavy boundary; 7 to 14 inches thick.

D—30 to 60 inches, olive-gray (5Y 5/2) sand and gravel; structureless (single grain); loose.

Machias gravelly loam, 0 to 2 percent slopes (MaA).—This nearly level soil originally had a cover of pine, spruce, and fir. An organic surface mat, about 3 inches thick, was underlain by a grayish-brown A2 horizon, 2 to 5 inches thick. These horizons were underlain by a thick, light olive-brown B21 horizon. Most of this soil is now cultivated and the A horizons and part of the original B21 horizon have been mixed together to form the present plow layer. A profile of this soil is described as representative of the series.

Most of this soil can be used for hay and pasture without artificial drainage, but yields of clovers and grasses are usually higher after drainage has been improved. Also, potatoes usually can be grown more profitably after the soil has been drained, because they can be planted earlier and will mature before heavy rains in fall. This normally results in higher yields of potatoes that are of better quality. The soil can usually be drained with tile. Since the soil is porous and nearly level, a tile drainage system is easy to install. In most places the soil material is friable to a depth of 20 to 25 inches, and, consequently, water moves freely to the tile.

This soil is not subject to erosion, even when planted continuously to potatoes, but a green-manure crop should be grown occasionally to limit the hazard of diseases and insects, as well as to maintain the desirable physical properties of the soil. Capability unit IIw–5.

Machias gravelly loam, 2 to 8 percent slopes (MaB).—Most of this gently sloping soil is cultivated, and the profile is similar to the one described as representative of the Machias series. Where forested, the soil has an organic surface mat, 2 or 3 inches thick, over a grayish-brown A2 horizon, about 3 inches thick. Other than a slightly thicker B21 horizon, the profile of the forested soil below the A2 horizon is similar to that of the cultivated soil.

Permeability is slightly impeded by a perched or high water table. Generally, the soil can be drained with tile, however. Water moves freely through the upper friable part of the soil to the tile. Even without artificial drainage, the water table drops by midsummer, and excessive water is not a problem. Surface runoff is medium, but sags and pockets limit runoff in places. Runoff can be improved in some of these spots through land smoothing.

A rotation of potatoes, oats, and a grass-legume crop is commonly followed on this soil. However, if potatoes are grown for 2 years and are followed by a green-manure crop, no severe loss of soil will result. Although erosion is seldom a problem, contour farming will help to retain moisture and enable it to soak into the soil. The soil is excessively wet early in spring and late in fall, but crops need the moisture supplied by rainfall in summer. This soil can be used for hay and pasture without artificial drainage or other conservation practices, but more uniform stands of clovers and grasses can be maintained when water is properly controlled. Also, high yields of potatoes can be obtained more consistently after the soil has been drained.

The forests consist mainly of spruce, fir, beech, birch, and maple. Spruce grows well, and, by selective cutting, it can be encouraged to predominate. Lumbering can be done easily in summer and winter. Logging roads that are to be used in spring and fall need drains and surface grading. Capability unit IIw–5.

Machias gravelly loam, 8 to 15 percent slopes (MaC).—This soil occurs as long bands, few of which are more than 300 feet wide; so it is difficult to farm. Most of it is only moderately steep, but some areas have slopes greater than 15 percent.

In undisturbed areas the soil has an organic surface mat over a leached, grayish-brown A2 horizon, 2 to 6 inches thick. This is underlain by a yellowish-brown B21 horizon. The lower part of the profile is similar to the profile of the cultivated soil described as representative of the series. The few acres of this soil that have been cultivated have a yellowish-brown gravelly loam Ap horizon, 7 or 8 inches thick.

Permeability is slow and surface runoff is rapid, but the soil responds well to proper management. Where row crops are grown, there is a hazard of erosion. If consistently high yields of potatoes are to be obtained, the crop must be planted in narrow strips that run across the slope and diversion ditches must be constructed. Grasses and legumes can be grown for pasture without artificial drainage or erosion control practices.

Pine, spruce, fir, and a few northern hardwoods grow in most areas. The soil is productive of white pine and spruce, and on many farms it should be used as woodland. By selective cutting of woodlots, white pine and spruce can be encouraged. Roads should be laid out on the contour to limit washouts. If it is necessary for roads to cross this soil, ditches should be built to divert runoff from the road outlets. Capability unit IIIew–5.

Made Land

Made land (Md).—This miscellaneous land type consists of a mixture of soil material, of variable texture, that has been disturbed. In places 18 inches or more of soil material has been spread over the surface. Most of the land in built-up areas is of this kind. Some of it consists of fertile lawns. Some areas, such as large parking lots, contain coal ashes, gravel, and subsoil material.

The land suitable for crops has not been mapped separately from that which is unsuitable. Consequently, use and management must be based on a study of each area. Made land is not classified as to capability.

Mapleton Series

The Mapleton series consists of well-drained, moderately deep and shallow soils on glacial till. The till was

689-561—64——4

derived mostly from weathered limestone and shale. The shale bedrock has seams of almost pure limestone at approximately right angles to the surface.

These soils are of shaly silt loam texture throughout the profile. The surface soil is acid, and the subsoil is medium acid to neutral. In a few places, the parent material is calcareous.

The Mapleton soils occur on irregularly rolling hills in the northeastern part of the survey area. They are common in the towns north of Hodgdon and occur in association with the well drained Caribou and moderately well drained Conant soils.

The Mapleton soils developed under a cover of maple, beech, and birch.

Representative profile—Mapleton shaly silt loam, 0 to 8 percent slopes (cultivated):

Ap—0 to 8 inches, dark-brown (10YR 4/3) shaly silt loam; strong, medium, granular structure; friable; strongly acid; smooth boundary; 6 to 9 inches thick.

B21—8 to 10 inches, yellowish-brown (10YR 5/6) shaly silt loam; weak, fine, granular structure; friable; medium acid; clear, wavy boundary; 2 to 5 inches thick.

B22—10 to 16 inches, light olive-brown (2.5Y 5/4) shaly silt loam; weak, fine, granular structure; friable; medium acid; clear, wavy boundary; 3 to 6 inches thick.

B3—16 to 20 inches, olive-brown (2.5Y 4/4) shaly silt loam with many soft, leached shale fragments; weak, fine, granular structure; friable; neutral; clear, wavy boundary; 4 to 8 inches thick.

Dr—20 inches, calcareous shale and limestone bedrock.

Mapleton shaly silt loam, 0 to 8 percent slopes (MhB).—Most of this soil is cultivated, and a profile of it is described as representative of the series. Some of the soil is forested and has a thin A1 horizon and a grayish-brown A2 horizon, about 2 inches thick. Except for a thicker B21 horizon, the profile of the forested soil below the A2 horizon is similar to the profile of the cultivated soil below the Ap horizon.

On the surface and throughout the soil are many nearly flat, yellowish-brown fragments of shale that range from ¼ inch to 10 inches in length. Very shallow spots and rock outcrops cover from 2 to 5 percent of the surface area. Few outcrops extend far enough above the surface to interfere with wheel equipment, but they are a hazard to equipment used in preparing seedbeds and in cultivating row crops. The depth of the soil to bedrock is generally about 18 to 20 inches, but the depth is 30 inches in places.

Good yields of clovers and grasses can be obtained if the soil is limed and fertilized. In some places the subsoil is alkaline and lime is not needed. Good yields of potatoes can be obtained if a rotation consisting of 2 years of potatoes and 1 year of a green-manure crop is followed. Surface runoff is medium on this undulating soil, so row crops should be planted in graded strips. This practice enables the soil to absorb most of the rainfall and thus make it available to the crop.

The forests are made up mainly of northern hardwoods. Lumbering can be done easily throughout the year. Capability unit IIe-1.

Mapleton shaly silt loam, 8 to 15 percent slopes (MhC).—Most of this soil is cultivated and has a profile similar to the one described as representative of the series. Some of the soil is forested and has a thin A1 horizon and a grayish-brown A2 horizon, about 2 inches thick. Except for a thicker B21 horizon, the profile of the forested soil below the A2 horizon is similar to the profile of the cultivated soil below the Ap horizon.

On the surface and throughout the soil are many nearly flat, yellowish-brown fragments of shale that range from ¼ inch to 10 inches in length. Very shallow spots and rock outcrops make up about 5 percent of the surface area. In some places the outcrops extend far enough above the surface to interfere with all types of farm equipment, especially those used in preparing seedbeds and in cultivating row crops. The depth of the soil to bedrock is generally about 16 to 18 inches, but in some places it is 24 to 30 inches.

Good yields of clovers and grasses can be obtained if the soil is limed and fertilized. In some places the subsoil is alkaline and lime is not needed. Good yields of potatoes can be obtained if the crop is planted in graded strips. Surface runoff is medium to rapid, so the graded strips are needed to limit runoff and erosion and to enable the soil to absorb most of the rainfall. Wherever possible, long slopes should have diversion ditches. The ditches collect runoff and divert the water off the fields before it gets enough speed to erode the soil severely.

A common rotation on this soil is 2 years of potatoes, 1 year of oats, and 2 years of grass-legume hay. On some farms green peas, grown for freezing, are substituted for oats.

The forests consist mainly of northern hardwoods. Lumbering can be done easily throughout the year. Capability unit IIIe-1.

Mapleton shaly silt loam, 15 to 35 percent slopes (MhD).—Some of this soil is cultivated and has a profile similar to the one described as representative of the series. Where forested, the soil has a thin A1 horizon and a grayish-brown A2 horizon, about 2 inches thick. Except for a thicker B21 horizon, the profile of the forested soil below the A2 horizon is similar to the profile of the cultivated soil below the Ap horizon.

On the surface and throughout the soil are many nearly flat, yellowish-brown fragments of shale that range from 1/4 inch to 10 inches in length. There are some very shallow spots and a few rock outcrops. The outcrops extend far enough above the surface to interfere with most farm equipment. The depth of the soil to bedrock is generally about 14 to 16 inches, but in many places it is 20 inches. Good yields of clovers and grasses can be obtained if the soil is limed and fertilized. In some places the subsoil is alkaline and lime is not needed.

If used intensively for potatoes, this soil most likely will erode. Surface runoff is rapid, and in most places the relief is too irregular for the use of contour stripcropping. The soil is more easily managed for hay or pasture than for cultivated crops.

The forests are mainly northern hardwoods. Lumbering can be done fairly easily. Capability unit IVe-1.

Mapleton very rocky silt loam, 0 to 15 percent slopes (MmC).—Most of this soil is forested. It has a surface mat of organic matter, 1 to 3 inches thick, underlain by 2 to 3 inches of a leached A2 horizon. In many places the A2 horizon resembles a mixed A1 and A2 horizon because it is dark grayish brown instead of grayish brown. In small spots close to pine trees, this horizon is grayish brown. This soil has B21 and B22 horizons similar to those of the representative profile, except that these horizons are not

as thick. The soil, in places, is only 4 to 6 inches thick over bedrock and often contains nearly 75 percent angular shale and limestone fragments.

Outcrops occur at intervals of 25 to 100 feet and cover 10 to 15 percent of the surface area. The upper 4 to 6 inches of soil contains about 30 percent shale fragments, 1 inch thick and 3 inches long, but few fragments other than those of shale or limestone occur in the soil.

Because it ranges from gently undulating to gently rolling, this soil is difficult to manage, except when used for permanent pasture or woodland. Capability unit VIs-1.

Mapleton very rocky silt loam, 15 to 35 percent slopes (MmD).—This soil is moderately steep or hilly, but, in most other respects, it resembles Mapleton very rocky silt loam, 0 to 15 percent slopes. It holds only a small amount of water available for plants, and surface runoff is too rapid for the soil to absorb much rainfall in summer. The forests contain maple, beech, and birch, but these trees are shallow rooted and they grow slowly. Because of the steep slopes and rock outcrops, lumbering is difficult on this soil. Capability unit VIIs-1.

Mixed Alluvial Land

Mixed alluvial land (Mn).—This mapping unit consists mostly of poorly and very poorly drained soils in alluvium that has been deposited in narrow bands along small streams. The areas have a wide range in texture and in degree of drainage, and most of them are only about 100 feet wide on either side of the streams.

Slow internal drainage and surface runoff and the hazard of flooding limit the use of Mixed alluvial land. Some of the better drained areas could be used for pasture, but most of them are covered by forests consisting mainly of elm, alder, willow, cedar, and spruce. Capability unit VIw-6.

Monarda Series

The soils of the Monarda series developed on very firm, slightly acid to neutral gravelly loam glacial till of Wisconsin age. The till was derived mainly from shale, slate, phyllite, and sandstone. These poorly drained soils occur in nearly level to gently sloping areas where the water table is close to the surface.

In cultivated areas the surface soil ranges from dark brown to very dark brown. The variation in color has resulted from the leveling of the mounds that occurred in areas that were formerly forested and the subsequent mixing of the A1 and A2g horizons.

Wooded areas still have mounds, 1 to 3 feet high and 1 to 10 feet apart. The mounds have a thick, light olive-brown A2g horizon and the slight depressions between the mounds have a thin, grayish-brown A2g horizon. Spruce and fir grow in these areas; the larger trees and a few pines grow on the mounds. In both cultivated and forested areas, the illuvial (B) horizons are mottled olive-gray, yellowish-brown, and grayish-brown gravelly loam. They generally are granular and friable, grading to platy and firm. In some places the B horizons have weak, subangular blocky structure and have thin clay films on the peds.

The substratum, or C horizon, is normally olive-gray to light olive-brown gravelly loam, but in some places it is gravelly sandy loam. It is generally massive and very firm, but in places the upper part has platy structure. This till material is usually medium acid to slightly acid, but in a few places it is neutral at a depth of about 5 feet.

Most of the acreage of these soils is stony to very stony, and in some places the surface is nearly covered with stones, 4 to 6 inches in diameter. In other areas stones, 10 to 18 inches in diameter, are scattered over the surface at intervals of 5 to 10 feet. In most areas, granite stones, 3 to 5 feet in diameter, are partly embedded in the soils at intervals of about 50 feet. Several thousand acres of the Monarda soils have stones, 6 to 24 inches in diameter, on the surface and partly embedded in the soils at intervals of 20 to 75 feet. Some areas have been cleared of trees and stones; others are still forested.

The Monarda soils developed on the same kind of parent materials as the very poorly drained Burnham soils, and these two kinds of soils generally occur in the same areas. The Monarda and Burnham soils are members of the same catena as the well-drained Plaisted and moderately well drained Howland soils.

The Monarda soils developed under spruce-fir forests and under a high water table.

In Southern Aroostook County, the Monarda soils are mapped only in undifferentiated units with the Burnham soils.

Representative profile—Monarda very stony silt loam, 0 to 2 percent slopes (forested):

A0—3 inches to 0, black (N 2/1), partly decomposed organic matter; extremely acid; many stones; abrupt, smooth boundary; 2 to 4 inches thick.

A1—0 to 3 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, coarse, granular structure; friable; strongly acid; abrupt, wavy boundary; 2 to 3 inches thick.

A2g—3 to 12 inches, grayish-brown (2.5Y 5/2) loam; few, faint, olive-brown (2.5Y 4/4) mottles; weak, fine, granular structure; friable; very strongly acid; clear, wavy boundary; 2 to 10 inches thick.

B21g—12 to 16 inches, olive-gray (5Y 5/2) gravelly loam with common, medium, distinct, dark yellowish-brown (10YR 4/4) and grayish-brown (10YR 5/2) mottles; weak, fine, granular structure; friable; strongly acid; 20 to 30 percent of mass is coarse fragments; clear, wavy boundary; 3 to 5 inches thick.

B22gm—16 to 28 inches, olive-gray (5Y 5/2) gravelly loam with many, medium, distinct, olive (5Y 5/3) mottles; moderate, medium, platy structure; firm but brittle; medium acid; 20 to 40 percent of mass is coarse fragments; abrupt, wavy boundary; 10 to 20 inches thick.

Cg—28 to 46 inches +, olive-gray (5Y 5/2) gravelly loam with few, fine, faint, olive (5Y 5/4) mottles; massive; very firm; slightly acid to neutral; 30 to 40 percent of mass is coarse fragments.

Monarda and Burnham silt loams, 0 to 2 percent slopes (MoA).—The Monarda soil in this undifferentiated unit has a profile like that described as representative of the Monarda series, and the Burnham soil has a profile like that described under the Burnham series.

The Monarda and Burnham soils are mapped as an undifferentiated unit because they occur in the same areas and because relief varies only slightly from the very poorly drained Burnham soil to the poorly drained Monarda soil. Many areas of each soil are 10 to 40 acres in size and can be easily identified in the field, but few of them could have been outlined accurately at the scale of the soil map. Some areas have stones, about 75 feet apart, but in other areas most of the stones have been removed from the surface.

More than half of the acreage of this mapping unit consists of the Monarda soil. A small acreage of the Monarda soil is used for hay and pasture—less than that of the same soil in Monarda and Burnham silt loams, 2 to 8 percent slopes. Only a few cleared fields are made up of Burnham soil, but the forested areas generally consist of both Monarda and Burnham soils.

Most areas have a cover of red spruce and fir, but some areas of Burnham soil have a cover consisting mainly of black spruce. The trees are shallow rooted, even those on the Monarda soil.

For 9 months of the year, the water table is about 1 foot below the surface. Both permeability and surface runoff are slow, so it is difficult to use these soils for crops. Undrained areas should be used mainly for forestry. Capability unit IVw–3.

Monarda and Burnham silt loams, 2 to 8 percent slopes (MoB).—Except for stronger slopes, these soils are similar to Monarda and Burnham silt loams, 0 to 2 percent slopes. They are gently sloping to gently undulating, and they have medium surface runoff and slow internal drainage.

These soils are used mainly for forestry, but they could be drained and used for pasture. Even when drained, however, the soils warm up slowly in spring, and so they are seldom used for row crops. Capability unit IVw–3.

Monarda and Burnham very stony silt loams, 0 to 8 percent slopes (MrB).—The Monarda soil in this undifferentiated unit has a profile like that described as representative of the Monarda series, and the Burnham soil has a profile like that described under the Burnham series. Most areas of this unit contain both Monarda and Burnham soils, but mainly Monarda.

These soils are mainly nearly level to gently undulating, but small areas are gently sloping. On the surface are many stones, 10 to 18 inches in diameter, and a few large stones or boulders. The relief is very irregular and consists of a succession of small mounds.

The soils are too wet and stony for cultivated crops. Forest trees grow on the mounds, and alder, willow, and nonforest trees grow on spots between the mounds. Vegetation is so thick that it is difficult to walk through the woods. Low, swampy areas are made up mainly of Burnham soil, and, where this soil is extensive, black spruce is the dominant forest tree. Spruce and fir are shallow rooted. Year-round logging roads need drains and surface grading. Lumbering can be done most easily when the soil is frozen. Capability unit VIIsw–3.

Peat and Muck

Peat and muck (Pa).—These organic soils have not been classified into soil series. They consist mostly of the remains of sedges, rushes, and woody plants that are in various stages of decomposition.

Most of the peat has formed from partly decayed sedges and rushes. Some species of heath plants grow on peat. Most of the areas are long and narrow and are influenced by surrounding soils. They are not well suited to uses other than forestry. They produce cedar, spruce, and fir.

Muck consists mostly of highly decomposed woody plants. The soil commonly ranges from 18 to 35 inches in thickness. The areas produce cedar and spruce. Capability unit VIIw–9.

Perham Series

The Perham series is made up of well-drained, medium-textured soils on firm, medium acid glacial till of Wisconsin age. The till was derived mainly from shale and slate. It is generally 3 to 6 feet thick over gray shale bedrock that lies in nearly vertical beds. The soils have bisequal profiles that consist of a Podzol over a soil similar to Gray-Brown Podzolic soils.

Where the soils are cultivated, the plow layer is dark-brown and light olive-brown gravelly silt loam that is a mixture of the original A0, A1, A2, and B21 horizons. In many spots the A2 horizon is below the Ap horizon or is slightly mixed with the B21 horizon.

Where forested, the soils have irregular microrelief consisting of mounds and depressions. This type of relief is not so pronounced as on the poorly drained soils, but it influences the color of the soils that are presently cultivated. There are only a few stones in the forests. Angular fragments of shale, 18 inches long, occur every 75 to 100 feet. The slightly stony forested areas have not been mapped separately from the cultivated areas, which also have a few stones.

At a depth of about 2 feet, or in the A′2 horizon, there are many angular fragments of shale. The A′2 horizon is so stony that it is difficult to remove this layer when a pit is dug. Once the A′2 is removed, however, further excavation is less difficult. This horizon divides the upper gravelly silt loam B horizons from the lower gravelly clay loam B′ horizons. The B′ horizons are yellowish brown to light olive brown and have subangular blocky structure and clay films on the peds. In many places these horizons are brittle and very firm and have manganese and organic stains around the pores.

In some places the soils have no C horizon. Where the bedrock is covered with less than about 5 feet of weathered till, silt and clay are between the seams of gray shale, which is shattered and occurs in vertical beds. Where the soils are more than 5 feet thick over bedrock, they have a C horizon of massive, firm gravelly loam.

Most areas of Perham soils occur at an elevation of 650 to 750 feet above sea level. In depressions on a similar kind of till and on the same geological formations are the somewhat poorly drained Daigle soils.

The Perham soils developed mainly under hardwood forests in which a few spruce and fir trees were scattered throughout the stands.

Representative profile—Perham gravelly silt loam, 2 to 8 percent slopes (cultivated):

Ap—0 to 10 inches, dark-brown (10YR 4/3) gravelly silt loam; moderate, medium, granular structure; very friable; strongly acid; 20 to 30 percent of mass is coarse fragments; abrupt, smooth boundary; 7 to 11 inches thick.

B21—10 to 12 inches, strong-brown (7.5YR 5/6) gravelly silt loam; weak, fine, granular structure; friable; strongly acid; 20 to 30 percent of mass is coarse fragments; clear, wavy boundary; 2 to 6 inches thick.

B22—12 to 21 inches, yellowish-brown (10YR 5/6) gravelly silt loam; weak, fine, granular structure; friable; strongly acid; 20 to 30 percent of mass is coarse fragments; clear, wavy boundary; 5 to 15 inches thick.

A′2—21 to 27 inches, grayish-brown (10YR 5/2) gravelly loam; weak, thin, platy structure; friable; strongly acid; 20 to 30 percent of mass is coarse fragments; clear, wavy boundary; 5 to 10 inches thick.

B′21t—27 to 33 inches, yellowish-brown (10YR 5/6) gravelly clay loam; strong, coarse, subangular blocky structure; firm; thin clay films on peds; many pores; few

manganese stains around pores: strongly acid; 20 to 30 percent of mass is coarse fragments; clear, wavy boundary; 3 to 12 inches thick.

B'22m—33 to 42 inches, yellowish-brown (10YR 5/8) gravelly clay loam; strong, thick, platy structure that breaks to coarse and medium, subangular blocky; very firm; brittle when dry; many pores; manganese stains common; strongly acid to medium acid; 20 to 30 percent of mass is coarse fragments; clear, wavy boundary; 8 to 16 inches thick.

C—42 to 60 inches, light olive-brown (2.5Y 5/6) gravelly loam; massive; firm; strongly acid to medium acid; 20 to 40 percent of mass is coarse fragments.

Perham gravelly silt loam, 0 to 2 percent slopes (PeA).—This nearly level soil occurs on the upper parts of drumlinlike hills and seldom receives runoff from other soils. Permeability is moderate to moderately slow. In some places the soil is slightly mottled at a depth of about 30 inches. This soil has been cleared of trees and surface stones and has a profile similar to that described as representative of the series. A few stones are brought to the surface each time the soil is plowed.

High yields of grasses and clovers are obtained if the soil is limed and fertilized. This soil produces high yields of potatoes, except during years when it retains too much water. Surface runoff is slow, and erosion is not a problem. The soil can be used intensively for potatoes without severe erosion. It is easily compacted, however, and a soil-building crop should be planted once every 3 to 5 years to help maintain desirable physical properties. Capability unit IIc-3.

Perham gravelly silt loam, 2 to 8 percent slopes (PeB).—This gently sloping soil occurs mainly on the sides of drumlinlike hills. Most of it is cultivated, and its profile is described as representative of the series.

Some of the soil is forested and has an organic mat, about 2 to 6 inches thick, over a very thin, nearly black A1 horizon. This is underlain by a grayish-brown silt loam A2 horizon, about 4 inches thick. Except for a thicker B21 horizon, the profile below the A2 horizon is similar to the profile of cultivated soil.

In forested areas angular shale fragments, 6 to 18 inches long, are on the surface at intervals of about 100 feet. In cultivated areas a few stones are on the surface or partly embedded in the soil.

Permeability is moderate to moderately slow because the content of silt is fairly high.

High yields of grasses and clovers are obtained if moderate amounts of lime and fertilizer are applied. If the soil is farmed in graded strips, a rotation consisting of 2 years of potatoes and 1 year of a green-manure crop can be followed without severe loss of soil. The soil will compact if it is used too intensively when wet.

Northern hardwoods, spruce, and fir are common in forested areas. Spruce grows well and, through selective cutting, can be encouraged to make up a greater percentage of the stands. Capability unit IIe-3.

Perham gravelly silt loam, 8 to 15 percent slopes (PeC).—Most of this soil is cultivated, and its profile is similar to the profile described as representative of the series. Several hundred acres of the soil are forested and have an organic mat, about 3 inches thick, over a very thin, nearly black A1 horizon. Below this is a grayish-brown gravelly silt loam A2 horizon, about 2 inches thick. Except for a slightly thicker B21 horizon, the profile of the forested soil below the A2 horizon is similar to the profile of the cultivated soil below the Ap horizon.

In forested areas angular shale fragments, 6 to 18 inches long, are on the surface at intervals of 75 to 100 feet. In cultivated areas a few stones are on the surface or partly embedded in the soil.

Permeability is moderate to moderately slow. Surface runoff is moderately rapid. The soil holds a large supply of moisture available for plants.

High yields of grasses and clovers are obtained if moderate amounts of lime and fertilizer are applied. High yields of potatoes can be obtained if the soil is farmed in contour strips to conserve rainfall and to control erosion. On long slopes diversion ditches help to control runoff and to prevent additional loss of soil.

The forests are made up mainly of mixed northern hardwoods and a few spruce and fir trees. Lumbering can be easily done throughout the year. Capability unit IIIe-3.

Perham gravelly silt loam, 15 to 25 percent slopes (PeD).—Some of this steep soil is cultivated, and its profile is similar to the profile described as representative of the series.

Several hundred acres of the soil are forested and have an organic mat, about 2 inches thick, over a very thin, nearly black A1 horizon. Below this is a grayish-brown gravelly silt loam A2 horizon, about 2 inches thick. Except for a slightly thicker B21 horizon, the profile of the forested soil below the A2 horizon is similar to the profile of the cultivated soil below the Ap horizon.

In forested areas angular shale fragments, 6 to 24 inches long, are on the surface at intervals of 75 to 100 feet. In cultivated areas a few stones are on the surface.

Permeability is moderate, and surface runoff is rapid. The soil holds a large supply of moisture available for plants.

Included with this soil is a soil that has slopes slightly steeper than 25 percent but that is used and managed like the rest of the soil.

Perham gravelly silt loam, 15 to 25 percent slopes, produces good yields of clovers and grasses and is well suited to permanent hay or pasture. Good yields of potatoes can be obtained if the soil is farmed in graded strips. On long slopes diversion ditches will limit loss of soil.

Mixed northern hardwoods, spruce, and fir grow in the forests. Lumbering can be done fairly easily. Capability unit IVe-3.

Plaisted Series

The Plaisted series is made up of well-drained, medium-textured soils developed on very firm, acid gravelly loam till of Wisconsin age. The till was derived mainly from shale and slate. Generally, it is 6 to 12 feet thick. In many places along streams, however, it is 20 feet thick and is likely to consist of gravelly sandy loam and to be firm rather than very firm. In many areas adjacent to the Thorndike soils, the Plaisted soils are only 30 to 40 inches thick. The Plaisted soils occur throughout all the survey area.

Most of the acreage is forested, and the areas have small mounds and depressions characteristic of northern forests. At the surface there is a mat of partly decomposed organic matter, 3 to 6 inches thick. A very thin A1 horizon underlies the organic mat, and in most places this horizon

cannot be distinguished. The gray, leached A2 horizon is very prominent and ranges from 2 to 6 inches in thickness. In many places the A2 horizon occurs in irregularly shaped pockets, and, in some of these, it curves under the B21 horizon. The B horizons are strong-brown to yellowish-brown gravelly loam, which is of granular structure in the upper part but grades to thin, platy structure just above the C horizon.

Most of the forested areas are stony to very stony, and in places the surface is nearly covered with stones, 4 to 6 inches in diameter. In some areas stones, 8 to 12 inches in diameter, are scattered over the surface at intervals of 2 to 3 feet. In most areas granite stones, 3 to 5 feet in diameter, are partly embedded in the soil at intervals of about 50 feet. Several thousand acres of these soils have stones, 6 to 24 inches in diameter, on the surface and partly embedded in the soil at intervals of 30 to 100 feet. Forested areas that have only a few stones, as well as cultivated areas, have been mapped as Plaisted gravelly loams. Some forested areas were once cleared of stones; others were never very stony. Even in cultivated fields, stones are on the surface, and a few more are turned up when the soils are plowed.

Where cultivated, the soils are olive-brown to yellowish-brown gravelly loam and have a few gray spots. The variation in color results from the incomplete mixing of the bleicherde and orterde (A2 and B horizons).

The Plaisted soils developed under hardwood forests.

Representative profile—Plaisted very stony loam, 8 to 15 percent slopes (forested):

A0—4 inches to 0, very dark brown, friable, partly decomposed layer of organic matter; extremely acid; clear, smooth boundary; 2 to 5 inches thick.

A2—0 to 4 inches, light-gray (5Y 7/2) gravelly sandy loam; weak, fine, granular structure; friable; very strongly acid; abrupt, irregular boundary; 2 to 6 inches thick.

B21—4 to 9 inches, strong-brown (7.5YR 5/6) gravelly loam; weak, fine, granular structure; friable; strongly acid; abrupt, wavy boundary; 2 to 5 inches thick.

B22—9 to 13 inches, yellowish-brown (10YR 5/4) gravelly loam; weak, fine, granular structure; friable; strongly acid; clear, wavy boundary; 3 to 9 inches thick.

B3—13 to 16 inches, light olive-brown (2.5Y 5/6) gravelly loam; moderate, thin, platy structure; firm; only slightly penetrated by roots; strongly acid; abrupt, wavy boundary; 3 to 10 inches thick.

C—16 to 36 inches +, olive-gray (5Y 5/2) gravelly loam; massive; very firm; medium acid; 30 percent of mass is coarse fragments.

Plaisted gravelly loam, 0 to 8 percent slopes (PgB).—Most of this nearly level to gently sloping soil has been cleared of trees and surface stones and is used for crops. Where cultivated, the soil has a surface layer of yellowish-brown gravelly loam, about 8 inches thick. Below a depth of 8 inches, the profile of this soil is similar to the profile described as representative of the series. Each time the soil is plowed a few stones are brought to the surface.

Some of this soil is forested and has a profile similar to that described for the series. The forested areas are not very stony, but stones, 10 to 24 inches in diameter, occur about every 100 feet. If the stones and trees are removed, areas now forested can be used for crops. These areas can be seeded to grasses and clovers and used for permanent hay or pasture; moderate applications of lime and fertilizer are needed. If the soil is farmed in strips on the contour, a rotation consisting of 2 years of potatoes and 1 year of a green-manure crop can be followed without severe erosion. Contour stripcropping not only reduces loss of soil, but also conserves rainfall for use by crops during summer.

Northern hardwoods and some spruce and fir are common in forested areas. Spruce grows well but receives competition from hardwoods. By selective cutting, spruce can be encouraged, but many woodlots should be managed for maple and birch. Year-round logging roads are easy to build and to maintain. Lumbering can be done easily. Capability unit IIe-3.

Plaisted gravelly loam, 8 to 15 percent slopes (PgC).—Some of this moderately steep soil is cultivated. It has a surface layer of yellowish-brown gravelly loam, about 8 inches thick. Below a depth of about 8 inches, the profile of the cultivated soil is like that of the representative profile described for the series. A few stones are on the surface and partly embedded in the surface soil. When the soil is plowed, a few more stones are generally brought to the surface, and these need to be removed before a crop is planted.

Many thousands of acres of this soil are still forested, and in these places the profile is similar to the profile described for the series. On the surface there are stones, 10 to 24 inches in diameter, at intervals of about 100 feet. Plant roots are confined to about the upper 15 inches of soil by a firm layer, and tree roots seldom penetrate more than a few inches into this layer.

The friable top part of the soil holds about 3 inches of available water, enough to promote good yields of grasses and clovers. The soil can be used for permanent hay or pasture with but little erosion. Potatoes yield well if they are planted in strips on the contour so as to conserve rainfall. Contour stripcropping also limits loss of soil. Diversion ditches can be used on long slopes to control runoff and to limit loss of soil.

The forests are made up mainly of mixed northern hardwoods and a few spruce and fir trees. Lumbering can be done easily throughout the year. Capability unit IIIe-3.

Plaisted gravelly loam, 15 to 25 percent slopes (PgD).—Where cultivated, this soil has a surface layer of yellowish-brown gravelly loam, about 8 inches thick. Below a depth of 8 inches, the profile of the cultivated soil is similar to the profile described as representative of the series. A few stones are on the surface and partly embedded in the surface soil. When the soil is plowed, a few more stones are usually brought to the surface, and these need to be removed before a crop is planted.

Many thousands of acres of this soil are still forested. Where forested, the soil has a profile like that described for the series. On the surface there are stones, 10 to 24 inches in diameter, every 25 to 100 feet. Plant roots are confined to about the upper 15 inches of soil by a firm layer, and tree roots seldom penetrate more than a few inches into this layer. The friable top part of the soil holds about 3 inches of available water, enough to promote good yields of grasses and clovers. The soil can be used for permanent hay or pasture with but little erosion.

It is difficult to use this soil for row crops without some loss of soil. Potatoes can be grown if contour stripcropping is practiced and diversion ditches are installed. These practices help to limit soil loss and to conserve rainfall for crops.

The forests are made up mainly of mixed northern hardwoods and a few spruce and fir trees. Logging roads should be built on the contour, and road outlets should be at an angle to the slope. Capability unit IVe-3.

Plaisted very stony loam, 0 to 8 percent slopes (PrB).—This soil occurs mainly in the forested parts of the survey area. Its profile is similar to the profile described as representative of the series.

Stones, 10 to 24 inches in diameter, are scattered over the surface at intervals of 5 to 10 feet. The stones limit the use of this soil mainly to forestry, but they do not interfere with woodland management.

Because relief is nearly level to gently sloping, surface runoff is slow; however, most of the rainfall enters only the upper 12 to 14 inches of soil. Below this depth the soil is very firm and compact, and it is seldom penetrated by rainfall in summer. Most tree roots are confined to the upper 16 inches of soil.

On the upper parts of ridges, this soil produces mostly maple, beech, and birch. Areas at the bases of ridges or on low hills generally have mixed stands of northern hardwoods, spruce, and fir. This soil is easy to manage for northern hardwoods and can be logged at any time of the year. Capability unit VIs-3.

Plaisted very stony loam, 8 to 15 percent slopes (PrC).—This soil occurs mainly in the forested parts of the survey area. A profile of it is described as representative of the series.

Stones, 10 to 24 inches in diameter, are scattered over the surface at intervals of 5 to 10 feet. The stones limit the use of this soil mainly to forestry, but they do not interfere with woodland management.

Because the slopes are moderately steep, surface runoff is medium. Most of the rainfall enters only the upper 12 to 14 inches of the soil. Below this depth the soil is very firm and compact, and it is seldom penetrated by rainfall in summer. Most tree roots are confined to the upper 16 inches of soil.

This soil produces mainly maple, beech, and birch. It can be easily managed for northern hardwoods and can be logged at any time of the year. Capability unit VIs-3.

Plaisted very stony loam, 15 to 25 percent slopes (PrD).—This steep soil is mostly forested, and it has a profile similar to that described as representative of the series.

Stones, 10 to 24 inches in diameter, are scattered over the surface at intervals of 5 to 10 feet. Surface runoff is rapid, unless a good cover of vegetation is maintained.

This soil produces good stands of maple, beech, and birch. Logging roads should be built on the contour to prevent loss of soil through gully erosion. Capability unit VIs-3.

Plaisted very stony loam, 25 to 45 percent slopes (PrE).—This soil is steep to very steep. It has a profile similar to the profile described as representative of the series, but in most places the A0 and A2 horizons are very thin.

Stones, 10 to 36 inches in diameter, are on the surface at intervals of 5 to 10 feet. The stones and steep slopes limit the use of the soil mainly to forestry. It is somewhat difficult to harvest trees, however.

Northern hardwoods are predominant, but a few spruce and fir trees grow on the northwestern slopes. Roads should be built on the contour. The road outlets should be protected from erosion because rapid runoff is likely to cause gullying. Capability unit VIIs-3.

Plaisted and Howland very stony loams, 0 to 8 percent slopes (PvB).—This undifferentiated unit is made up up of about 75 percent Plaisted soil, and about 25 percent Howland soil. The profile of the Plaisted soil is similar to the profile described as representative of the Plaisted series, and the profile of the Howland soil is similar to that described under the Howland series.

These Plaisted and Howland soils are forested, and they have been mapped together because the boundaries between them could not have been drawn accurately on the soil map.

The soils support mixed stands of hardwoods and softwoods. At present maple, birch, and beech are most common, but, by selective cutting, spruce can be encouraged to predominate.

Some areas could be cleared and used for cultivated crops, but most of them are too far from public roads to make this practice feasible. Capability unit VIs-3.

Plaisted and Howland very stony loams, 8 to 15 percent slopes (PvC).—This undifferentiated unit is made up of about 75 percent Plaisted soil and 25 percent Howland soil. The profile of the Plaisted soil is similar to the profile described as representative of the Plaisted series, and the profile of the Howland soil is similar to that described under the Howland series.

These Plaisted and Howland soils are forested, and they have been mapped together because the boundaries between them could not have been drawn accurately on the soil map.

The soils support mixed stands of hardwoods and softwoods. They are productive of spruce, and lumbering can be done easily. Capability unit VIs-3.

Red Hook Series

The Red Hook series is made up of poorly drained soils developed on acid, stratified sand and gravel derived mainly from shale, slate, and sandstone. These soils are on terraces and glacial outwash throughout all the survey area.

Where cultivated, the soils have a surface horizon of very dark gray to grayish-brown silt loam over a mottled A2g horizon that ranges from 4 to 12 inches in thickness. The color of the plow layer and the thickness of the bleicherde (A2g) horizon vary because of the uneven relief of the formerly undisturbed areas. Where forested, the soils have a thin A1 horizon and a thick, mottled A2g horizon.

The Red Hook soils have gravelly silt loam and gravelly loam B horizons. The B horizons have fine, granular structure and are acid in reaction. There is considerable variation in the color of the B horizons. The color ranges from olive gray with yellowish-brown and gray mottles, as shown in the representative profile of the series, to dominantly yellowish brown (10YR 5/6) with common, medium, grayish-brown mottles, or to light yellowish brown (10YR 6/4) with many, fine, grayish-brown and yellowish-brown mottles.

The Red Hook soils are members of the catena that includes the somewhat excessively drained Colton, the well-

drained Stetson, the moderately well drained Machias, and the very poorly drained Atherton soils.

The Red Hook soils have developed under spruce and fir forest.

Representative profile—Red Hook silt loam, 0 to 2 percent slopes (forested):

A0—2 inches to 0, partly decomposed organic matter.

A1—0 to 3 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, granular structure; friable; strongly acid; abrupt, wavy boundary; 2 to 4 inches thick.

A2g—3 to 10 inches, grayish-brown (10YR 5/2) gravelly silt loam; few, fine, faint, yellowish-brown mottles; weak, thin, platy structure; friable; strongly acid; abrupt, wavy boundary; 4 to 12 inches thick.

B21g—10 to 15 inches, olive-gray (5Y 5/2) gravelly silt loam; common, medium, distinct, yellowish-brown and gray mottles; weak, fine, granular structure; friable; strongly acid; clear, wavy boundary; 3 to 6 inches thick.

B22g—15 to 23 inches, olive-gray (5Y 5/2) gravelly silt loam; many, fine, distinct, yellowish-brown and gray mottles; weak, fine, granular structure; friable; medium acid; clear, wavy boundary; 5 to 10 inches thick.

Cg—23 to 29 inches, olive-gray (5Y 4/2) gravelly loam; few, fine, distinct, yellowish-brown and gray mottles; weak, thin, platy structure; friable; medium acid; clear, wavy boundary; 5 to 10 inches thick.

D—29 to 40 inches +, olive-gray (5Y 4/2) sand and gravel; single grain; loose; medium acid.

Red Hook and Atherton silt loams, 0 to 2 percent slopes (RaA).—A profile of the Red Hook soil in this undifferentiated unit has just been described. A profile of the Atherton soil is described under the Atherton series.

More than half of the acreage of this mapping unit is made up of Red Hook soil. The Red Hook and Atherton soils differ little in relief, and these two kinds of soils seldom can be identified, except by examinations of their profiles. Because of their similarity, the soils have not been mapped separately.

For 8 months of the year, the water table is about 1 foot below the surface. Because surface runoff is slow, the soils are slightly difficult to drain. In some places there is a perched water table, and the soil below the water table is loose and coarse and is rapidly permeable.

A small acreage of the Red Hook soil is used for hay and pasture—less than that of Red Hook and Atherton silt loams, 2 to 8 percent slopes. A few cleared fields consist of the Atherton soil, but most forested areas consist of both Red Hook and Atherton soils.

Most areas of these soils have a cover of red spruce and fir, but some areas of the Atherton soil produce mainly black spruce. The trees are shallow rooted, even on the Red Hook soil. Capability unit IVw–5.

Red Hook and Atherton silt loams, 2 to 8 percent slopes (RaB).—The Red Hook soil in this undifferentiated unit has a profile similar to the profile described as representative of the series, and the Atherton soil has a profile similar to that described under the Atherton series. These soils are undulating or gently sloping and have slow to medium surface runoff. The water table is usually close to the surface. The Red Hook soil can be drained, but, even then, it cannot be worked until late in spring or early in summer.

Only a few hundred acres of these soils have been cleared, and most of the acreage has a cover of spruce and fir. Most cultivated fields consist of the Red Hook soil, but forested areas generally contain both the Red Hook and Atherton soils. Capability unit IVw–5.

Stetson Series

In the Stetson series are deep, well-drained gravelly loam soils developed from sandy and gravelly materials deposited by water. The gravelly loam and gravelly sandy loam subsoil extends to a depth of 18 or more inches. Below this depth is gravelly loamy sand or stratified sand and gravel. The sand and gravel were derived mainly from shale, slate, or limestone, but a small percentage was derived from granite. Although the parent material of sand and gravel is similar to that of the Colton soils, the depth to this material differs.

The Stetson soils occur on terraces along rivers and streams. In some places they are on eskers. These soils are associated with the somewhat excessively drained Colton, the moderately well drained Machias, the poorly drained Red Hook, and the very poorly drained Atherton soils, all of which formed in a similar kind of parent material.

The Stetson soils developed under a forest of pine and northern hardwoods.

Representative profile—Stetson gravelly loam, 0 to 2 percent slopes (cultivated):

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) gravelly loam; weak, fine, granular structure; friable; 20 percent of mass is gravel; abrupt, smooth boundary; 8 to 12 inches thick.

B21—10 to 15 inches, dark yellowish-brown (10YR 4/4) gravelly loam; weak, fine, granular structure; friable; 25 percent of mass is gravel; abrupt, wavy boundary; 4 to 8 inches thick.

B22—15 to 18 inches, yellowish-brown (10YR 5/6) gravelly sandy loam; weak, fine, granular structure; friable; 25 percent of mass is gravel; abrupt, wavy boundary; 2 to 6 inches thick.

B3—18 to 40 inches, yellowish-brown (10YR 5/4) gravelly loamy sand; single grain (structureless); loose; 25 percent of mass is gravel; abrupt, wavy boundary; 15 to 30 inches thick.

D—40 to 60 inches, light olive-brown (2.5Y 5/6) sand and gravel; single grain (structureless); loose; 30 percent of mass is gravel.

Stetson gravelly loam, 0 to 2 percent slopes (SgA).—This nearly level soil generally occurs on the tops of terraces. Most of it has been cultivated, and a profile, observed in a cultivated field, is described as representative of the series.

In a few small forested areas that have not been cultivated, a layer of organic material, about 2 inches thick, overlies a grayish-brown A2 horizon, 2 to 3 inches thick. Below the A2 horizon, the forested soil is similar to the cultivated soil. The forested soil has a slightly thicker B21 horizon, however.

The top 30 inches of the profile holds about 3½ inches of water available for plants. Surface runoff is slow, and most of the rainfall is absorbed by the soil.

High yields of potatoes, oats, grasses, and clovers are obtained when adequate amounts of lime and fertilizer are applied. Erosion is not a problem, except in areas at the bases of hills. In these places runoff should be diverted from this soil. Capability unit IIc–5.

Stetson gravelly loam, 2 to 8 percent slopes (SgB).—Most of this soil is gently sloping, but a few small areas are moderately steep. Nearly all of the gently sloping areas are cultivated, and in these places the profile is similar to the profile described for the series. In the more strongly sloping forested areas, the soil has a thin organic surface

mat over a grayish-brown loam A2 horizon, 2 to 3 inches thick. Except for a slightly thicker B21 horizon, the profile of the forested soil below the A2 horizon is similar to the profile of the cultivated soil.

The soil produces high yields of potatoes, oats, grasses, and clovers when adequate amounts of lime and fertilizer are applied. Long slopes should be farmed in strips on the contour to limit runoff and to conserve rainfall. Capability unit IIe–5.

Thorndike Series

The Thorndike series is made up of well-drained soils developed on glacial till of Wisconsin age. The till was derived mainly from shale and slate. In only a few places are the soils more than 20 inches thick, and in most places the lower part is the illuvial (B3) horizon. The soils have no C horizon. The B3 horizon is underlain by a Dr layer of shattered shale bedrock, which occurs in nearly vertical beds. The soils are granular and friable throughout. Thin, flat shale fragments, 3 to 10 inches long, make up about one-fourth of the soil material.

Most areas of these soils are forested, although several thousand acres are cultivated. In some areas these soils have not been disturbed, except for woodland operations once in 25 to 50 years. The forests consist of northern hardwoods and a few white pine. Hardwood twigs and leaves have built an organic mat (A0 horizon), 2 to 6 inches thick, over the irregular microrelief, which consists of small mounds, 1 to 2 feet high. The organic mat is normally thicker between the mounds, where it is underlain by a black A1 horizon consisting of 1/4 to 1/2 inch of mixed mineral and organic matter. The A1 horizon seldom can be distinguished on the mounds. Under the A0 or A1 horizons is a gray or grayish-brown, leached horizon. This eluvial (A2) horizon is commonly thickest on the mounds; in only a few places is it so highly leached as in the depressions. Generally, a grayish-brown A2 horizon, 3 to 4 inches thick, is on the mounds and a gray A2 horizon, 2 to 3 inches thick, is between the mounds. In some places, especially on the mounds, tongues of the A2 extend several inches into the lower horizons. Below the A2 horizon is a brown to strong-brown illuvial (B21) horizon, 4 to 8 inches thick. In some places the upper part of the B21 horizon contains small cemented aggregates or concretions. These are normally dark reddish brown and may be cemented with organic material.

Where cultivated, the soils commonly have a yellowish-brown to dark yellowish-brown Ap horizon of shaly silt loam. This is generally underlain by a dark-brown B21 horizon, but in spots there is a grayish-brown A2 horizon.

In many forested areas, there are a few shale fragments, longer than 10 inches, on the surface. Also, flat shale fragments, 10 to 18 inches long, occur about every 100 feet. When formerly forested areas or cultivated fields are plowed, additional fragments are brought to the surface. Shaly soils in forested areas, as well as shaly soils in cultivated areas, have been mapped as Thorndike shaly silt loams.

Areas in the southwestern and western parts of Southern Aroostook County have a few crystalline rocks, as well as shale fragments and outcrops of bedrock. The outcrops vary in size but are generally larger on the steeper slopes. The rocky soils have been mapped as Thorndike very rocky silt loams, and additional detail on the rock outcrops is given under the descriptions of individual Thorndike soils.

The Thorndike soils are much like the Mapleton soils, which also developed from thin glacial till. Most of the shale fragments in the Thorndike soils are hard and noncalcareous. The Mapleton soils, in contrast, contain many soft, leached limy fragments of shale.

Representative profile—Thorndike shaly silt loam, 0 to 8 percent slopes (cultivated):

Ap—0 to 6 inches, dark-brown (10YR 4/3) shaly silt loam; moderate, medium, granular structure; friable; strongly acid; abrupt, wavy boundary; 6 to 10 inches thick.

B21—6 to 10 inches, dark-brown (7.5YR 4/4) shaly silt loam; weak, fine, granular structure; friable; 20 to 30 percent of mass is coarse fragments; strongly acid; abrupt, wavy boundary; 2 to 6 inches thick.

B22—10 to 16 inches, yellowish-brown (10YR 5/8) shaly silt loam; weak, fine, granular structure; friable; 30 to 40 percent of mass is coarse fragments; strongly acid; abrupt, wavy boundary; 4 to 8 inches thick.

B3—16 to 19 inches, yellowish-brown (10YR 5/4) shaly silt loam; weak, very fine, granular structure; friable; about 50 percent of mass is coarse fragments; medium acid; clear, irregular boundary; 2 to 6 inches thick.

Dr—19 inches +, gray, acid shale bedrock.

Thorndike shaly silt loam, 0 to 8 percent slopes (ThB).—A profile of this gently undulating soil is described as representative of the series. On the average, the soil is 16 inches deep to shale bedrock. There is generally one rock outcrop or a small, very shallow spot per acre. The outcrops consist of shattered shale that is firm in place and is a hazard to farm machinery.

This soil is friable, and roots are distributed throughout. About 30 percent of the plow layer is made up of flat shale fragments, 2 to 6 inches long. The fragments restrict the use of mechanical potato harvesters.

Most of the soil is used for potatoes grown in a rotation that includes peas, small grains, and grass-legume hay crops. The areas are mainly irregularly sloping, and few can be farmed in strips on the contour. But, wherever possible, contour stripcropping should be practiced. It helps to conserve moisture for plants, as well as to limit loss of soil. Capability unit IIe–1.

Thorndike shaly silt loam, 8 to 15 percent slopes (ThC).—Several thousand acres of this soil are cultivated. The profile is similar to the one described as representative of the series.

Some of the soil is forested. Except for the top 8 inches, the profile in forested areas of this soil is similar to the profile in cultivated fields. The upper part of the profile of forested soil, and the degree of stoniness, is discussed under the description of the series.

This soil normally occurs on the sides of ridges and has rolling relief. There is generally one rock outcrop or very shallow spot per acre. Few outcrops extend far enough above the surface to interfere with wheel equipment, but they are a hazard to equipment used in preparing seedbeds and in cultivating row crops.

In most places the soil is about 15 inches deep over bedrock, but the depth ranges from 6 inches to about 2 feet. The soil is friable, and roots are distributed throughout. Roots of deep-rooted plants extend into seams in the bedrock.

The soil holds enough moisture to produce good yields of grasses or clovers. It can be used for permanent hay or pasture if lime and fertilizer are applied. If potatoes are grown, the soil should be farmed in strips. This practice reduces runoff, makes more water available for the crop, and reduces the hazard of erosion. On long slopes, surface runoff can be limited through the use of diversion ditches. The ditches must be laid out to avoid rock outcrops.

The forests are mainly mixed northern hardwoods and a few spruce and fir trees. Lumbering can be easily done at any time of the year. Capability unit IIIe–1.

Thorndike shaly silt loam, 15 to 25 percent slopes (ThD).—Several thousand acres of this soil are cultivated. The profile is similar to the one described as representative of the series.

Some of the soil is forested. Except for the top 8 inches, the profile in forested areas of this soil is similar to the profile in cultivated fields. The upper part of the profile of forested soil and the degree of stoniness are discussed under the description of the series.

There are a few very shallow spots and rock outcrops. Generally, the outcrops extend far enough above the surface to interfere with nearly all kinds of farming equipment. Most of the soil is 12 to 15 inches deep over shale that occurs in nearly vertical beds. The soil is friable, and roots are distributed throughout.

This soil holds enough moisture to produce good yields of grasses and clovers. It can be used for permanent hay or pasture if lime and fertilizer are applied. Because surface runoff is rapid, the soil most likely will erode if it is used in the regular rotation that includes potatoes. The relief is too irregular for contour stripcropping, and the shallow spots limit the use of diversion ditches. Occasionally, a row crop could be grown in narrow strips without excess loss of soil.

The forests are mainly mixed northern hardwoods and a few spruce and fir. Lumbering can be done fairly easily. Wherever possible, logging roads should be laid out on the contour and outlets made at an angle to the slope. Capability unit IVe–1.

Thorndike shaly silt loam, 25 to 45 percent slopes (ThE).—This soil is too steep to be used for row crops that require heavy equipment, but it is used for pasture. In general, the soil is 12 to 16 inches deep, but there are about two shaly outcrops per acre. Surface runoff is rapid, and gullies may develop along paths used by animals.

Some areas produce northern hardwoods and, on the northwestern slopes, some spruce. Lumbering can be a problem. Wherever possible, logging roads should be laid out on the contour and outlets made at an angle to the slope. Capability unit VIIs–1.

Thorndike very rocky silt loam, 0 to 8 percent slopes (TkB).—This soil is gently sloping, but most slopes are irregular. At the surface is an organic mat, 1 to 3 inches thick, over a gray A2 horizon, 2 to 4 inches thick. The B and C horizons are similar to the ones of the profile described as representative of the series. The depth to shale bedrock is very irregular; it generally ranges from 6 to 30 inches.

Outcrops of bedrock occur at intervals of 25 to 100 feet and cover 5 to 10 percent of the surface. In some places the bedrock does not extend to the surface but is covered by 3 to 6 inches of soil. A few, loose shale stones—about 1 cubic yard per acre—are on the surface.

This soil is productive of hardwoods. It has almost pure stands of northern hardwoods, consisting mostly of maple, beech, and birch. Lumbering can be done easily. Capability unit VIs–1.

Thorndike very rocky silt loam, 8 to 15 percent slopes (TkC).—This moderately steep soil has an organic mat at the surface. The mat consists mainly of hardwood twigs and leaves, and it overlies a thin, discontinuous, nearly black horizon of mixed mineral and organic materials. Below this is a grayish-brown silt loam A2 horizon, about 2 inches thick. Under the A2 is a B21 horizon, about 6 inches thick. Below a depth of about 8 inches, the profile of this soil is similar to the profile described as representative of the series.

The depth to shale bedrock ranges from 6 to 36 inches, but, in general, it is 12 to 16 inches. Outcrops of bedrock occur at intervals of 25 to 100 feet and cover about 15 percent of the surface. Many slopes extend in one general direction for a thousand or more feet, but because of the rock outcrops, the relief is irregular. About 1 cubic yard per acre of loose shale fragments is on the surface or partly embedded in the soil.

This soil produces almost pure stands of northern hardwoods—mostly maple, beech, and birch. Lumbering can be done fairly easily because the outcrops and stones are not numerous or large enough to interfere with the construction of logging roads. The bedrock can be removed easily, and it is often used as fill for roads constructed in low, wet areas. Capability unit VIs–1.

Thorndike very rocky silt loam, 15 to 25 percent slopes (TkD).—This soil has an organic mat at the surface. The mat consists mainly of hardwood twigs and leaves, and it overlies a thin, discontinuous, nearly black horizon of mixed mineral and organic materials. Below this is a grayish-brown silt loam A2 horizon, about 2 inches thick. Under the A2 is a B21 horizon, about 6 inches thick. Below a depth of about 8 inches, the profile of this soil is similar to the profile described as representative of the series.

This strongly rolling and hilly soil has fairly large outcrops of bedrock at intervals of 25 to 100 feet; interspersed between these outcrops are very small outcrops. About 2 cubic yards per acre of loose stones are on the surface. The thickness of the soil is very irregular; it ranges from 6 inches to 2 feet.

Because it is steep, rocky, and very shallow, this soil is best used for forestry. Northern hardwoods—mostly maple, birch, and beech—grow on it. Logging roads should be built on the contour, and outlets should be protected from erosion. Capability unit VIIs–1.

Thorndike very rocky silt loam, 25 to 45 percent slopes (TkE).—This soil has an organic mat at the surface. The mat consists mainly of hardwood twigs and leaves, and it overlies a thin, discontinuous, nearly black horizon of mixed mineral and organic materials. This is underlain by a grayish-brown silt loam A2 horizon, about 2 inches thick. Under the A2 is a B21 horizon, about 6 inches thick. Below a depth of about 8 inches, the profile of this soil is similar to the profile described as representative of the series.

This hilly to steep soil occurs on the sides of high ridges or mountains, and, in most places, it is 6 to 18 inches deep. Spots of bare rock, covering about 9 square feet, are interspersed with rock outcrops that occur as ridges 3 feet wide and 50 feet long. These areas occupy from 5 to 20 percent of the surface.

Because it is steep, rocky, and shallow, this soil is best used for forestry. Northern hardwoods are prevalent, but some spruce trees grow on the northwestern slopes. Logging roads are very difficult to build and to maintain on this soil. Capability unit VIIs-1.

Thorndike and Howland soils, 0 to 8 percent slopes (TsB).—The soils in this undifferentiated unit are forested and have not been disturbed.

Nearly 75 percent of the acreage is made up of the Thorndike soil, which is about 16 inches thick over shale bedrock. The Thorndike soil has an organic mat, 2 to 6 inches thick, at the surface. Below this is a thin, discontinuous A1 horizon. The A1 is underlain by a grayish-brown A2 horizon, about 3 inches thick. Below a depth of about 8 inches, the profile of this Thorndike soil is similar to the profile described as representative of the series. Rock outcrops and very shallow spots comprise 5 to 15 percent of the surface area. Only a few shale fragments are on the surface. The characteristics of the upper part of the soil, the degree of stoniness, and the occurrence of rock outcrops are described in more detail under the Thorndike series.

About 25 percent of the acreage of this undifferentiated unit is made up of the moderately well drained Howland soil. Except in the top 8 inches, the profile of this soil is similar to the representative profile described under the Howland series. Loose stones, 10 to 12 inches in diameter, are scattered over the surface at short intervals. In some places granite stones are partly embedded in the soil.

These Thorndike and Howland soils are used as woodland supporting mainly spruce, fir, maple, beech, and birch. Lumbering can be done easily. Capability unit VIs-3.

Thorndike and Howland soils, 8 to 15 percent slopes (TsC).—This undifferentiated unit is composed of 75 percent Thorndike soil and 25 percent Howland soil. It occurs in the extensively forested parts of Southern Aroostook County.

For additional information about these soils and their use, refer to the descriptions of the Thorndike and Howland series and the descriptions of other Thorndike and Howland soils (mapped separately) that have slopes of 8 to 15 percent. Capability unit VIs-3.

Winooski Series

In the Winooski series are moderately well drained silt loams developed on recent stream deposits. The soils occur in narrow bands along the larger streams. They rarely are covered with water, except early in spring.

Most areas of Winooski soils are cultivated and have an Ap horizon, 8 to 10 inches thick. Where forested, the soils have an A1 horizon rather than an Ap horizon. The A1 horizon is similar to the Ap horizon but is thinner and contains more organic matter.

These soils are in the same catena as the Hadley soils. The Winooski soils developed under a cover of elm, swamp maple, spruce, and fir.

Representative profile—Winooski silt loam (cultivated):

Ap—0 to 11 inches, light olive-brown (2.5Y 5/4) silt loam; weak, fine, granular structure; friable; strongly acid; abrupt, smooth boundary; 8 to 12 inches thick.

C1—11 to 13 inches, light olive-brown (2.5Y 5/6) silt loam; weak, fine, granular structure; friable; acid; abrupt, smooth boundary; 2 to 6 inches thick.

C2g—13 to 36 inches, grayish-brown (2.5Y 5/2) silt loam with fine, olive-gray (5Y 4/2) mottles; weak, fine, granular structure; friable; strongly acid.

Winooski silt loam (Wn).—This is the only Winooski soil that has been mapped in Southern Aroostook County. It is nearly level and has moderately slow permeability and slow surface runoff. It is only a few feet above streams and is subject to overflow. The soil is seldom flooded, however, except early in spring when it is usually frozen. The water level of the streams is usually several feet lower than the soil during summer, when the areas are used for potatoes. The soil is likely to become puddled and cloddy if it is farmed while wet. The soil responds well to good management, and if it is kept fertile and supplied with organic matter, it can be used intensively for potatoes. Capability unit IIw-6.

Soil Formation and Classification

This section is in two main parts. The first explains the five factors of soil formation and tells how the soils of Southern Aroostook County have formed. The second part describes the great soil groups into which the soil series have been classified.

Though no chemical and physical data on the soils are given in this report, the "Soil Survey of Aroostook County, Maine: Northeastern Part" contains data on the Caribou, Conant, Daigle, and Perham soils, and the "Soil Survey of Penobscot County, Maine" contains data on the Monarda and Plaisted soils.

Formation of the Soils

The important factors in the development of soils are parent material, climate, plants and animals, relief, and time. The kind of soil that develops in any given environment depends on the interaction of these five factors. At any given point, the effect of one or more factors may be more clearly expressed than the effects of others. For example, low relief and a high water table show a greater effect than parent material in the development of some very poorly drained soils. In most gently sloping, well-drained soils, the effects of climate, parent material, and plants and animals are most clearly expressed.

In Southern Aroostook County, plants and animals cause local variations in soils, but, in a broad sense, their effect is fairly uniform over the county. Parent material, relief, and time, however, are so different that they have caused marked differences in the soils. Following is a discussion of the effect of each of the soil-forming factors on the soils of Southern Aroostook County.

Climate

Southern Aroostook County has a cool continental climate with long, cold winters and cool summers. Precipitation is evenly distributed throughout the year and totals about 37 inches.

The soils freeze to a depth of about 60 inches in unprotected places. Most of the soils, however, are covered with a blanket of snow for about 5 months each year. The snow helps to protect the soils from freezing during that part of the year when air temperature is low. Soils under a coniferous forest, where the snow is not disturbed by strong winds, seldom freeze below a depth of 24 inches.

Soils that are protected from deep freezing are also slow to reach air temperature after the air warms up in spring. Such soils are only slightly above the freezing point for about 8 months of the year.

Soils with southern exposures often freeze deeply but warm early in spring. These soils have nearly the same temperature as the air. The soil temperature is above 50° F. for several months each year.

Differences in snow cover indicate that the soils are subject to local variations in climate, even though they lie in the same broad climatic zone. Relief and exposure also influence the climate of small areas and, in turn, the soils formed in these areas.

One group of soils, the Podzols (see "Classification of the Soils"), probably shows the effects of climate more than others. Long, cold winters and fairly cool summers have resulted in accumulation, or at least the very slow decay, of leaf litter. Thus, in wooded areas, the Podzols have a thick mat of decaying leaves. As rainfall permeates the mat, humic acids and other leaching agents are formed and are instrumental in leaching the mineral soil just below the surface. Consequently, the highly leached A2 horizon of Podzols has resulted from the interaction of climate and vegetation.

Plants and animals

Plants and animals influence the development of soils. At one time trees grew on nearly all the soils in the county, and they still are the most prominent kind of vegetation. The degree of natural drainage determines, to a large extent, the kind of trees that are most common in an area.

Birch, beech, and maple grow on the well-drained ridges. Also, a few white pines are mixed with the northern hardwoods.

On the moderately well drained parts of the ridges or lower slopes, white spruce, red spruce, and balsam fir are predominant. Some northern hardwoods are scattered throughout these areas.

On the poorly and very poorly drained areas, red spruce, black spruce, and balsam fir are most common. Also, there are individual tamarack and white pine trees. A few poorly drained areas that have some natural drainage contain mainly white-cedar. Sedges and rushes grow on very poorly drained areas that have poor natural outlets. Individual black spruce trees occur in these areas and along their borders.

The less easily observed plants, such as lichens, moss, and fungi, also influence the kinds of soils that form. They probably played a larger part in soil development at the end of the last glacial period than they do today. These plants grow on the small areas of rock outcrops.

Deer, bear, rabbits, and other native animals convert many plants to organic matter which, in turn, influences other soil-forming processes. Earthworms, which are common in the cultivated soils and in woodland along the edges of fields, also influence the development of soils.

Parent material

The soils of Southern Aroostook County developed mainly from glacial till and glacial outwash. Less extensive areas of soils developed from recent stream sediments and accumulations of organic matter.

Glacial till is the most common kind of parent material. It consists of a mixture of clay, silt, sand, gravel, cobblestones, and boulders. All the till is stony, but the number and size of stones depend on the kind of rock from which the till was derived.

In the northeastern corner of the survey area, from Houlton northward, the till was derived from calcareous shale and limestone. About 30 percent of it is gravel, and a smaller percentage consists of stones, 10 to 18 inches in diameter. The stones were derived mainly from shale, sandstone, and limestone.

Till from dark-gray limestone is the parent material of some soils in the townships of Linneus, New Limerick, and Ludlow. About 60 percent of this till consists of silt-sized particles. Probably less than 10 percent of the fragments are gravel. A few angular stones are on the surface and in the soil. These were derived mainly from limestone.

In the rest of the area, the till was derived from shale, slate, sandstone, and granite. Many stones, 10 inches to 3 feet in diameter, are in and on the soil. Most of the till is less than 5 feet thick, but it is commonly 20 feet thick, and in a few places it is nearly 100 feet thick.

The glacial outwash is water-sorted material that consists mainly of bands of sand and gravel. Silt and clay make up a small percentage of the material. Stones, larger than 10 inches in diameter, comprise less than 5 percent.

The outwash occurs in the form of eskers, kames, and esker-deltas. Small areas of shallow outwash are on the sides of glacial till ridges. Long, narrow areas of outwash parallel Bither Brook and the branches of the Meduxnekeag and Mattawamkeag Rivers.

Recent sediments of silt and fine sand were deposited by streams when they overflowed their banks. During periods of heavy rainfall, these streams still overflow, but usually only traces of alluvial material are left on the flood plain.

Organic matter has accumulated in shallow ponds or depressions without natural outlets. The organic material is mainly partly decayed trees, shrubs, sedges, and rushes. Peat and muck form in this material.

Relief

Southern Aroostook County is largely a region of gently rolling hills with crests 200 feet above the valley floor. The general elevation ranges from about 500 to 800 feet above sea level. Nearly all the hills are elongated in a north-south direction. The hills are steepest on their northern ends and become more gently sloping toward the south. They are fairly broad, and many of them are flat on top.

The western part of the area is higher than the eastern part. Several prominent groups of hills rise above the general elevation. They consist of erosional remnants of more resistant rocks and of granite intrusions. Among these intrusions are hills, both east and west of Sam Drew Mountain in the town of Oakfield, that rise above 1,200 feet. North of this range of hills are a number of moun-

tains of about equal height. These include Saddleback, Number Nine, Hedgehog, Maple, Hovey, and Meduxnekeag Mountains. Several of these mountains are north of the survey area. Pickett Mountain, on the Penobscot-Aroostook County line, is 1,750 feet high.

Three great esker systems are prominent topographic features. The Houlton Esker extends nearly 160 miles from its head northwest of Monticello to its terminus south of the county at Lubec. It is one of the largest eskers in the world. The Haynesville Horseback has two branches that follow the East and West Branches of the Mattawamkeag River to their meeting point in kame fields and deltas at Haynesville. From here, this esker continues into Washington County as one large, steep-sided ridge. A third esker system originates in Penobscot County at Patten, enters the survey area in the town of Crystal, and then follows the valley of Macwahoc Stream to the south.

Southern Aroostook County is drained by three major basins. The northern part is drained northward into the Aroostook River and eastward through the Meduxnekeag River. The southeastern part is drained by streams that flow into the St. Croix River, which forms much of the Maine-New Brunswick boundary. The rest of the survey area is a part of the Penobscot Basin and is drained largely by branches of the Mattawamkeag River.

A number of lakes occur in the survey area, but most of them are small, and all of them are of glacial origin. Few, if any, show the effect of glacial scouring. Some were formed by glacial debris that blocked preglacial valleys; others are small ponds in kettle holes.

As a factor in soil formation in Southern Aroostook County, relief accounts for striking differences in soils over short distances. Local differences in drainage, runoff, erosion, and exposure to wind and rain are due, in part, to relief. For example, localized areas of poorly drained soils have formed where the slope is nearly level or concave. On the other hand, relief is an important factor in the lack of soil formation on some steep rocky hills. In these places the soils are very shallow or rocky because the soil material is easily dislodged and moved downslope by gravity.

Time

Time is an important factor in the development of soils. The parent material is changed to soil by the interaction of climate and animals and plants, influenced by relief. This process is slow when compared with a human lifetime; it probably takes several hundred years to develop a soil profile that contains A, B, and C horizons. The most recent parent materials, such as alluvial deposits, have been changed only slightly by the environment. Glacial till, the oldest parent material in the area, has been changed greatly by the environment. Most of the soils on glacial material have clearly expressed A, B, and C horizons, although they have formed since the last glaciation (Late Wisconsin) and are relatively young in terms of geological time.

Classification of the Soils

The soil series of the survey area are classified by great soil groups in table 7. A great soil group consists of soil series that have many internal features in common. A discussion of soil series, as well as that of the lower categories of soil classification, the type and the phase, is given in the section "How Soils Are Named, Mapped, and Classified."

The soil series that have formed from one kind of parent material, as shown in table 7, are a catena; that is, soils that have formed in the same kind of parent material but are not alike because they formed under the influence of different drainage and relief.

Following are descriptions of each great soil group and of the soil series within each group. Detailed profile descriptions of each series are given in the section "Descriptions of the Soils."

Podzols

Many of the well drained and moderately well drained soils in Southern Aroostook County are members of the Podzol great soil group. These mature soils show the influence of climate and plants in their development.

Podzols probably develop in the following manner. The soil forms under a forest cover in a cool, moist climate where rainfall exceeds evaporation. Much of the precipitation passes through the soil and becomes part of the ground water. Under the cool climate, a layer of organic material builds up through the slow decay of leaf litter, twigs, and a few trees. When the decomposition of organic material and the addition of leaves and twigs reach an equilibrium, the soil has an A0 horizon, 2 to 6 inches thick. Part of the decomposed organic matter mixes with the mineral soil and forms a discontinuous mineral horizon, called the A1 horizon.

Rainwater reacts with carbon dioxide, created, in part, by fungi breaking down the organic material and forming organic acids. The leached material moves down in the soil and forms complex colloidal compounds of organic matter and of iron, aluminum, and other bases. These humus-sesquioxide complexes move out of the top mineral layer and leave a horizon high in silica and low in bases. This leached horizon, called the A2, is generally 2 to 6 inches thick and grayish brown in color.

Part of the material that leaches out of the A2 horizon is lost in drainage water, but part remains in the profile and forms a horizon that is high in humus and sesquioxides. This illuvial (B) horizon is strong brown in the upper part, but the color fades with increasing depth. The part of the B horizon that is highest in humus and sesquioxides and has a strong color is called the B2. In most places the B2 can be subdivided into a B21h, a horizon of nearly black humus, and a B21ir, a brown sesquioxide horizon. In some soils there is a B3 horizon that is transitional between the illuvial horizon and the parent material.

A large part of the survey area is in forests, and here the soils have not been disturbed, except to harvest trees. Some places have been logged only a few times. In these relatively undisturbed places, the Podzols have irregular microrelief marked by mounds 1 to 3 feet high and 1 to 10 feet apart. Some mounds are prominent, others are subdued. The base of one mound nearly touches the base of the surrounding mounds.

The forest floor is covered with litter of leaves, twigs, and a few decaying trees. This litter is underlain by similar material that is nearly decomposed. These materials make up the A0 horizon, which is 1 to 4 inches thick.

TABLE 7.—*Soil series arranged according to parent material, great soil group, and drainage*

Parent material and great soil group	Somewhat excessively drained	Well drained	Moderately well drained	Moderately well drained to somewhat poorly drained	Poorly drained	Very poorly drained
Sandy and gravelly glacial outwash on terraces:						
Podzol	Colton	Stetson	Machias			
Low-Humic Gley					Red Hook	
Humic Gley						Atherton.
Glacial till from—						
Acid shale, slate, phyllite, and sandstone:						
Podzol		Plaisted		Howland		
Low-Humic Gley					Monarda	
Humic Gley						Burnham.
Weathered calcareous shale and limestone: Podzol over Gray-Brown Podzolic-like soils.		Caribou	Conant			
Weakly calcareous shale and slate: Podzol over Gray-Brown Podzoliclike soils.		Perham		Daigle [1]		
Thin glacial till from—						
Weathered acid shale and slate: Podzol		Thorndike				
Weathered calcareous shale and limestone: Podzol		Mapleton				
Moderately deep glacial till from dark-gray limestone and calcareous shale: Brown Forest		Linneus				
Recent stream deposits of silt and very fine sand: Alluvial		Hadley	Winooski			
Organic deposits: Bog						Peat and muck.

[1] Somewhat poorly drained soils.

In most places the organic horizon is underlain by an A1 horizon that is made up of organic and mineral material. Where present, the A1 is generally very dark grayish brown and is ¼ to 1 inch thick. In old, subdued mounds there is a coarse, granular A1 horizon, ½ to 1 inch thick, but this horizon is indistinct between the mounds. In some of the prominent mounds, there are horizons, 3 to 4 inches thick, that apparently are mixtures of A1 and A2 horizons because they range from dark grayish brown to very dark grayish brown.

Under the A0 to A1 horizon is a gray to grayish-brown, strongly acid mineral A2 horizon with weak, platy or weak, granular structure. This horizon is 1 to 6 inches thick. Generally, it is thickest on the mounds, where it may form pockets, 4 to 6 inches deep and 1 to 3 inches wide. In places these pockets of the A2 horizon curve under the B2; consequently, a vertical cut through a mound may pass through the horizons in the following order: A0, A1, A2, B2, A2, and B2. In only a few depressions is the A2 horizon more than 2 inches thick.

Below the A2 horizon is a strong-brown to yellowish-brown B horizon. The B horizon has two or three subhorizons, and each subhorizon is paler or less brown than the subhorizon above it. The upper subhorizon, or B21, is friable, has granular structure, and is strong brown. Below the B21 is a B22 horizon that is yellowish brown to strong brown, has granular to platy structure, and is friable to firm. In some soils there is a B3 horizon that varies in characteristics according to the kind of parent material. In places this horizon is transitional from the B to the C horizon.

Where cultivated, the soils show evidence of the original microrelief, even after they have been farmed for many years. Cultivation has mixed the organic horizons with the bleicherde and orterde and has resulted in the forming of a dark-brown Ap horizon that shows a few spots of strong brown, yellowish brown, and grayish brown. When the land was cleared and first plowed, the A horizon and part of the B21 were reversed where there were mounds. The moldboard plow sliced off the top of the mounds and turned them into the depressions. This left the A2 horizon below or partly covered by the B21.

Further cultivation mixed the horizons and partly obliterated the original ones, although in many freshly

plowed fields, the soil has three shades of brown. Below the Ap there is usually a thin, strong-brown B21 horizon, but in some spots the underlying horizon is a yellowish-brown B22, and in other spots the horizon sequence is Ap, A2, B21, and B22.

The C horizon, or parent material from which the soils developed, has been in place since the last glacial age.

In Southern Aroostook County, the following soils are members of the Podzol great soil group: Plaisted, Howland, Stetson, Machias, Colton, Thorndike, Mapleton, Caribou, Perham, Conant, and Daigle. The Caribou, Perham, Conant, and Daigle soils have underlying horizons that resemble those in Gray-Brown Podzolic soils.

Plaisted series.—The well-drained Plaisted soils developed on very firm, massive, acid glacial till. The till was derived mainly from slate and shale but contains some granitic material. The Plaisted soils have A, B, and C horizons. The B2 horizon is gravelly loam and has granular structure. In some places the soils have a B3 horizon that has moderate to weak, platy structure and is firm. The C horizon consists of olive-gray gravelly loam. This horizon is very firm and is platy to massive.

Howland series.—The Howland soils are moderately well drained to somewhat poorly drained. These soils developed from the same kind of till as the Plaisted soils. They have mottled gravelly loam B2g or B3g horizons. The upper part of these horizons has granular structure, and the lower part generally has platy structure. The Howland soils have a mottled, massive C horizon of very firm gravelly loam.

Stetson series.—The Stetson are well-drained soils on alkaline, stratified sand and gravel derived mainly from calcareous shale, slate, and sandstone. They have a gravelly loam and gravelly sandy loam B2 horizon with granular structure. In most places they have a B3 horizon of gravelly loamy sand but do not have a C horizon. Instead, the B3 horizon is underlain by a D horizon of stratified sand and gravel at a depth of about 40 inches.

Machias series.—The moderately well drained Machias soils developed on weakly acid to alkaline, stratified sand and gravel derived mainly from calcareous shale, slate, and sandstone. They have a mottled gravelly silt loam or gravelly loam B2g horizon that is friable and has granular structure. They normally lack a C horizon and are underlain at a depth of about 30 inches by a D horizon of stratified sand and gravel.

Colton series.—The Colton soils are somewhat excessively drained. They developed on slightly acid to alkaline, stratified sand and gravel derived mainly from shale, slate, and sandstone. They have a thin, granular B horizon that becomes coarser textured with increasing depth. These soils do not have a C horizon but are underlain at a depth of about 20 inches by a D horizon of stratified sand and gravel.

Thorndike series.—The well-drained Thorndike soils developed from thin glacial till and shattered shale and slate bedrock. They have a shaly silt loam B2 horizon that has granular structure. More than 30 percent of the lower part of the B2 consists of hard, gray shale fragments. In most places these soils do not have a C horizon. At a depth of about 20 inches, they are underlain by shale bedrock.

Mapleton series.—The well-drained Mapleton soils were derived from thin glacial till and shattered, calcareous shale bedrock. They have a B2 horizon of granular shaly silt loam; more than 25 percent of the material is soft, leached fragments of limestone. In many places the soils do not have a C horizon. They are underlain at a depth of about 20 inches by calcareous shale.

Caribou series.—The Caribou soils are well-drained Podzols that developed over Gray-Brown Podzoliclike soils. They have a granular gravelly loam B2 horizon. Below the B2 is a leached, light olive-brown A′2 horizon that, in most places, is 5 to 10 inches thick. The A′2 horizon and the underlying B′ horizon resemble similar horizons in Gray-Brown Podzolic soils. Below the A′2 horizon is the B′2 horizon, which has subangular blocky structure and has clay films on the peds. The B′2 horizon overlies firm, neutral to calcareous glacial till.

Perham series.—The Perham soils are well-drained Podzols that developed over Gray-Brown Podzoliclike soils. The B2 horizon is granular silt loam. At a depth of about 24 inches, there is a leached A′2 horizon of grayish-brown gravelly loam. The underlying B′2 horizon has subangular blocky structure and has clay films on the peds. The A′2 and the B′2 horizons resemble eluvial and illuvial horizons of Gray-Brown Podzolic soils. In most places these horizons are underlain by a C horizon of firm gravelly loam. In a few places, however, the soils have no C horizon.

Conant series.—The Conant soils are moderately well drained Podzols that developed over Gray-Brown Podzoliclike soils. They have a loamy B2 horizon of granular structure at a depth of about 12 inches. There is a leached A′2 horizon of light olive-brown gravelly loam. Below this is a B′2g horizon of subangular blocky gravelly clay loam. Clay films are on the peds. The B′2g horizon is underlain by firm, calcareous gravelly loam glacial till.

Daigle series.—The Daigle soils are somewhat poorly drained Podzols that developed over Gray-Brown Podzoliclike soils. They have a granular, slightly mottled B2g horizon. Below the B2g is a leached A′2 horizon that is mottled grayish brown. The A′2 is underlain by a B′2g horizon of clay loam that is very firm and brittle. Clay films are on the peds. Very firm, weakly mottled glacial till occurs at a depth of about 45 inches.

Humic Gley soils

Humic Gley soils have a thick, very dark A horizon over a gray or mottled B or C horizon. They are poorly drained or very poorly drained soils that have formed under vegetation typical of very wet land.

In Southern Aroostook County, the Humic Gley soils formed under spruce and fir forests. They occur in flats, depressions, and swampy areas that have a high water table. These soils are saturated to the surface for about 9 months of the year. When forest vegetation decays, organic matter is added to the surface of the soils. The organic matter is mixed with the upper part of the mineral soil by the windthrow of trees, by worms, and by small animals. As a result, an A1 horizon, 3 to 12 inches thick, is formed. The A1 is slightly mottled and high in organic matter. For a short time each year, the downward movement of water and organic acids leaches bases, iron oxides, and aluminum oxides from the soil material below the A1 horizon. This results in the formation of a thin A2g horizon.

Because the soils are saturated below the A2g horizon most of the year, the color is dominantly olive gray below

a depth of 5 to 10 inches. In most places, however, the water table drops below 10 inches during dry periods in summer. This allows sufficient oxidation of iron for the formation of strongly colored mottles in the B2g horizon. The processes of reduction, translocation, and oxidation are mainly responsible for the strong gleying and mottling in these soils. Some Humic Gley soils formed on very firm soil material and have a shallow profile. Others formed on friable material and have a profile that is 20 to 30 inches thick.

In Southern Aroostook County, the Burnham and Atherton soils are in the Humic Gley great soil group.

Burnham series.—The very poorly drained Burnham soils formed on very firm, slightly acid to neutral glacial till of the Wisconsin age. The till was derived from shale, slate, phyllite, and sandstone. The soils have a thick A1g horizon of mottled silt loam, a thin B2g horizon of mottled loam, and a very firm C horizon of mottled gravelly loam.

Atherton series.—The very poorly drained Atherton soils developed on medium acid, stratified sand and gravel derived from shale, slate, and sandstone. These soils have an A1 horizon of grayish-brown, mottled silt loam, 6 to 12 inches thick. Below this is a thin, discontinuous A2g horizon that is grayish brown and mottled. In many places, no A2g has developed. The B2 horizon consists of olive or olive-gray, mottled sandy loam.

Low-Humic Gley soils

The Low-Humic Gley soils have a thinner A1 horizon and slightly better drainage than the Humic Gley soils; but deeper in the profile, soils of these two great soil groups are similar. The A2g horizon of the Low-Humic Gley soils is thick.

The Low-Humic Gley soils in Southern Aroostook County developed under spruce and fir forests. Under the cool, moist climate and forest vegetation, eluvial horizons, similar to those in Podzols, have formed. The organic matter was broken down by fungi, worms, and small animals, and, as a result, an A1 horizon consisting of 2 to 4 inches of mixed organic and mineral material was formed. The material below the A1 horizon was leached by organic acids and a grayish-brown, slightly mottled A2g horizon, 2 to 10 inches thick, developed. A strongly mottled B2g horizon formed below the A2g horizon.

The Low-Humic Gley soils occur in flats and depressions that have a fluctuating water table. For 6 to 9 months of the year, the water table is within a few inches of the surface. The high water table limits movement of air in the soils, and this results in the reduction of soil minerals. Some oxidation of minerals occurs in midsummer. The processes of reduction, translocation, and oxidation of minerals, especially iron, have made the soils mottled grayish brown and olive brown.

Some of the Low-Humic Gley soils have a fragipan that partly inhibits internal drainage. In others slow internal drainage is usually caused by a high water table.

The Low-Humic Gley soils in Southern Aroostook County are members of the Monarda and Red Hook series.

Monarda series.—The Monarda soils are poorly drained. They developed on very firm, neutral to slightly acid gravelly loam glacial till of Wisconsin age. The till was derived from shale, slate, and phyllite. The soils have a thin A1 horizon of silt loam over a thick A2g horizon of loam. The B2g horizon is mottled gravelly loam. The upper part has granular structure, and the lower part, platy structure. The C horizon consists of olive-gray gravelly loam till.

Red Hook series.—The Red Hook are poorly drained soils on medium acid, stratified sand and gravel derived mainly from shale, slate, sandstone, and limestone. These soils have a thin A1 horizon of silt loam and a thick A2g of slightly mottled gravelly silt loam. In some places the B2g horizon is mottled gravelly silt loam. In other places it is mottled gravelly loam. The C1g horizon consists of mottled olive-gray gravelly loam that is underlain at a depth of about 30 inches by a D horizon of sand and gravel.

Brown Forest soils

The Brown Forest soils have a distinct, dark-brown or grayish-brown A1 horizon, 2 to 10 inches thick. The B horizon has granular structure and has brown colors that change slightly with increasing depth. It apparently derives its color from iron oxides that were released as the parent material weathered in the presence of humus. The content of organic matter decreases with depth, and the pH increases. The content of clay remains about constant or decreases with depth. Generally, the Brown Forest soils are saturated with bases from the surface downward and are leached of carbonates to only a slight depth. These soils form on highly calcareous parent material.

In Southern Aroostook County, only the Linneus series has been classified in the Brown Forest great soil group.

Linneus series.—The Linneus are well-drained soils that developed in material derived from dark-gray limestone and calcareous shale. They have an A1 horizon of very dark grayish-brown silt loam, 2 to 8 inches thick. The B horizon is yellowish-brown silt loam with granular structure. In some places there is a C horizon of olive silt loam. In others the soil material has weathered to the D horizon of dark-gray limestone.

Alluvial soils

The Alluvial soils in this part of Aroostook County are in narrow stream valleys where silty and sandy sediments have been deposited recently by streams. They have not been in place long enough for distinct horizons to develop. The native vegetation was mixed coniferous and deciduous trees. Some organic matter has been added to the soil by the decay of vegetation, and, as a result, an A1 horizon of mixed mineral and organic material has formed. The soils have only A and C horizons. Soil-forming processes have not changed the sediments enough to form a distinct B horizon below the A1.

In Southern Aroostook County, the Hadley and Winooski series are classified in the Alluvial great soil group.

Hadley series.—The well-drained Hadley soils developed on stream-deposited sediments derived mainly from shale and slate. They have light olive-brown, acid silt loam A1 or Ap horizons and an olive-brown or grayish-brown C horizon.

Winooski series.—The moderately well drained Winooski soils developed on silty stream deposits. They have an A horizon of light olive-brown silt loam and a C horizon of mottled olive-brown or grayish-brown silt loam.

Bog soils

The Bog soils have a mucky or peaty surface soil underlain by peat. Generally, they have a cover of swamp or marsh vegetation and are most common in humid regions. In Southern Aroostook County, only Peat and muck are classified as Bog soils.

Peat and muck.—These organic soils consist of partly decomposed sedges, rushes, and trees that once grew along the banks of shallow ponds and in depressions. The muck is more highly decomposed than the peat. Peat and muck show little or no development of horizons and are generally waterlogged throughout the year.

Climate of Southern Aroostook County [3]

Moderately warm summers, cold winters, and ample rainfall characterize the climate of Southern Aroostook County. Winds from the Atlantic Ocean, 75 miles and more to the south, occasionally affect the weather, but the prevailing winds are from the west in summer and from the northwest in winter. The climate, therefore, is influenced more by air moving over the continent than by that moving in from the ocean.

As is typical of a dominantly continental climate, temperatures range widely from winter to summer and also from day to night. Day-to-day variation in temperature is common because the area is near the paths of weather systems that alternately bring in warm air from the south and cold air from the north. Additional variation results from differences in the topography within Southern Aroostook County. Temperatures are slightly higher and rainfall is slightly less at the lowest elevations in the southern part than at the highest elevations in the northwestern part. Elevations are less than 500 feet above sea level in most areas in the southern part but are more than 1,000 feet in some areas in the northwestern part.

There is not enough variation in temperature and rainfall from one place to another in the survey area to require different types of agriculture. Potatoes are the most important crop, and oats and hay are next in importance. The climate is suitable for dairying and the raising of beef, as well as for the growing of peas and other crops for canning.

Table 8 gives temperature and precipitation data from the U.S. Weather Bureau Station at Houlton. Because the climate within Southern Aroostook County varies only slightly, these data are typical of most of the area. Though most of the data can be used as a guide for any locality in the area, local topography has an especially important effect on the occurrence of frost or of freezing temperatures. Local pockets in depressions, especially at higher elevations, are likely to have lower temperatures at night than the station at Houlton. These pockets are particularly subject to freezing temperatures.

[3] This section prepared by ROBERT E. LAUTZENHEIZER, State climatologist, U.S. Weather Bureau, Boston, Mass.

TABLE 8.—*Temperature and precipitation data at Houlton*

[Elevation, 410 feet]

Month	Temperature					Precipitation						
	Average daily—			Two years in 10 will have at least 4 days with—			One year in 10 will have—			Average number of days with—		
	Maximum	Minimum	Mean	Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—	Average	Less than—	More than—	Average snowfall	Snowfall of 1 inch or more	Snow cover of 1 inch or more	Precipitation of 0.10 inch or more
	°F.	°F.	°F.	°F.	°F.	Inches	Inches	Inches	Inches			
January	23.7	4.3	14.0	40	−16	2.72	1.3	4.9	19.6	6	30	7
February	26.8	5.8	16.3	39	−17	2.52	1.6	4.1	21.6	7	28	6
March	36.7	16.4	26.6	48	−6	2.70	1.6	4.8	16.4	5	28	6
April	49.4	29.6	39.5	65	20	2.85	1.4	4.2	5.6	2	8	7
May	64.7	40.1	52.4	81	29	2.77	.9	4.5	.4	(1)	(1)	7
June	72.9	49.8	61.4	86	38	3.48	1.8	5.6	(2)	------	------	8
July	78.8	55.9	67.4	89	45	3.26	1.6	5.0	------	------	------	7
August	76.8	53.2	65.0	87	42	2.83	1.4	4.7	------	------	------	6
September	67.6	44.7	56.2	81	32	3.29	1.4	5.7	(2)	------	------	7
October	55.5	35.1	45.3	70	24	3.79	1.1	6.0	1.2	(1)	(1)	7
November	40.8	25.9	33.4	56	8	3.61	1.8	5.5	7.6	3	6	8
December	27.0	10.4	18.7	45	−11	3.19	1.1	5.6	17.4	5	24	7
Year	51.7	30.9	41.3	[3] 91	[4] −23	37.01	31.1	44.2	89.8	28	124	83

[1] Averages less than half a day.
[2] Trace.
[3] Average annual maximum.
[4] Average annual minimum.

Table 8 gives the probability of the occurrence of specified temperatures, rather than the extreme high and low temperatures that have been recorded. For planning purposes, these probable temperatures may be more useful than the extremes. In general, the maximum and minimum temperatures given in table 8 under the heading "Two years in 10 will have at least 4 days with—" differ only slightly from the monthly maximum and minimum temperatures, based on a record over a long period of years. A more detailed discussion of temperature in Southern Aroostook County follows.

Temperature

The mean (average) temperature is higher than 50° F. during 5 months of the year. In almost all places in the survey area, the mean temperature in January is below 16°. The mean temperature in July ranges from nearly 70°, in the extreme southern part, to about 67°, in the extreme northern part. In an average summer, the temperature reaches 90° four or five times. A few summers have had such temperatures more often, and in one summer readings of 90° occurred on 16 days. Nearly all nights are cool, even in the warmest summers.

Table 9 gives the mean (average) number of days each month that specified minimum and maximum temperatures have been recorded at Houlton. Also given are the heating degree-days and growing degree-days.

Degree-days are computed by recording each day the significant mean departures from a selected base temperature and by totaling these departures for the month and for the year. The temperature selected as a base and the departures to be recorded depend upon the purpose of the computation. A base of 65° F. has been selected for computing heating degree-days because that is the lowest mean daily temperature at which no heat is required for homes. To get the departure for 1 day, subtract the mean temperature for that day, if less than 65°, from 65°. A day with a mean temperature of 55°, for example, has a value of 10 heating degree-days. In contrast, a day with a mean of 65° or more has no heating degree-days because no heat is required. Heating degree-days are useful in calculating the amount of fuel needed in an average year and in comparing a particular season with the average. They are frequently used by gas, electric, and fuel companies in estimating fuel and power requirements.

Data on growing degree-days are useful in planning the planting and harvesting dates of crops. Growing degree-days accumulate when the mean temperature is higher than the minimum mean temperature (base temperature) at which plants continue to grow. They are calculated by subtracting this base temperature from the actual mean temperature for the day. The figures in table 9 have been calculated from two standard bases: 40° for cool-weather crops, such as potatoes and peas and grasses predominant in this section; and 50° for warm-weather crops, such as corn. Thus, a day on which the mean temperature is 60° accounts for 20 growing degree-days for cool-weather crops and 10 growing degree-days for warm-weather crops.

A substantial number of growing degree-days in a given month, as shown in table 9, does not necessarily indicate that crops can be planted safely. There may still be a possibility of frost.

Table 10 gives the probability of freezing temperatures at Houlton after specified dates in spring and before specified dates in fall. For example, table 10 shows that there is one chance in ten that the temperature will drop to 32° or lower on or after June 3, and eight chances in ten that it will drop to 32° or lower on or after May 7. The chance of a freeze on or after May 21 is fifty-fifty. A freeze of 32° seriously damages sensitive plants, though hardier ones may withstand even lower temperatures.

At Houlton the average length of the freeze-free season is 123 days. The season may be slightly longer in the

Table 9.—*Frequency of selected temperatures and heating degree-days and growing degree-days at Houlton*

Month	Average number of days with—				Accumulated heat units		
	Maximum temperature of—		Minimum temperature of—		Heating degree-days	Growing degree-days	
	90° F. or higher	32° F. or lower	32° F. or higher	0° or lower	Base 65° F.	Base 50° F.	Base 40° F.
January	0	24	30	13	1, 570	----------	----------
February	0	19	28	11	1, 370	----------	----------
March	0	9	29	4	1, 190	----------	----------
April	0	(1)	21	0	760	5	80
May	(1)	0	6	0	385	110	385
June	1	0	(1)	0	125	340	645
July	2	0	0	0	35	540	850
August	1	0	0	0	75	465	775
September	(1)	0	3	0	270	190	490
October	0	(1)	13	0	605	35	195
November	0	5	23	(1)	940	----------	40
December	0	21	30	8	1, 420	----------	----------
Year	4	78	183	36	8, 745	1, 685	3, 460

[1] Less than half a day.

TABLE 10.—*Probability of freezing temperatures at Houlton after specified dates in spring and before specified dates in fall*

Probability	32° F. or lower	28° F. or lower	24° F. or lower	20° F. or lower	16° F. or lower
Spring:					
1 year in 10, later than	June 3	May 20	May 4	Apr. 23	Apr. 11.
2 years in 10, later than	May 30	May 16	Apr. 30	Apr. 19	Apr. 7.
5 years in 10, later than	May 21	May 7	Apr. 21	Apr. 10	Mar. 29.
8 years in 10, later than	May 7	Apr. 28	Apr. 12	Apr. 1	Mar. 20.
Fall:					
1 year in 10, earlier than	Sept. 8	Sept. 17	Oct. 4	Oct. 19	Oct. 31.
2 years in 10, earlier than	Sept. 12	Sept. 22	Oct. 8	Oct. 24	Nov. 5.
5 years in 10, earlier than	Sept. 21	Oct. 1	Oct. 17	Nov. 2	Nov. 14.
8 years in 10, earlier than	Oct. 1	Oct. 11	Oct. 26	Nov. 11	Nov. 23.

extreme southern part of Southern Aroostook County and slightly shorter at higher elevations. In some low pockets, frost is a threat during an occasional summer, even in the warmest months.

Precipitation

Approximately 37 inches of precipitation, including moisture from snowfall, is received at Houlton. (See table 8.) The annual total increases slightly to the south of Houlton, and it is 40 inches or slightly more in the extreme southern part of the survey area. About 3 to 3.5 inches of precipitation per month is received during the growing season and through fall, but slightly less is received during winter and early in spring. Plenty of water is available for domestic and industrial needs, for the generation of electrical power, and for the irrigation of crops during the usually short, but fairly common, dry spells.

Snowfall varies considerably from year to year, and in a given year may vary markedly in local areas. The average seasonal total ranges from 80 inches or more, in the extreme southern part of the survey area, to 100 inches or more, in the northwestern part.

Records from the Weather Bureau station at Houlton show that 1 inch or more of snow covers the ground continuously for more than a month every winter. The ground, however, may become bare of snow briefly during an occasional year, even in midwinter. On the average, the ground is covered with snow at least 1 inch deep from December 13 through April 4, a period of 113 days. In fairly open areas, snow has covered the ground from November 21 to May 3. The cover of snow remains longer in wooded areas than in open areas.

In the nearly 30 years during which records on snowfall have been compiled at Houlton, the maximum yearly depth of snow on the ground has ranged from 11 to 45 inches and has averaged 27 inches. The snow is generally deepest near the end of February. From data recorded at Houlton, the probabilities of different amounts of snowfall occurring in a day have been calculated as follows:

Amount of snowfall:	*Number of snowfalls per season*
2 inches or more	13 to 30; average 19.
4 inches or more	4 to 16; average 8.
8 inches or more	0 to 5; average 2.
10 inches or more	average 1; none in many seasons; more than 1 in one out of four.

See table 8 for additional data on snowfall.

Storms

Thunderstorms, along with strong winds, sometimes damage crops in Southern Aroostook County. The frequency of the thunderstorms varies; such storms occur on less than 15 days during some years, but on more than 25 days in others. The storms are most frequent from June through August, but they may occur in any month. The heavy rains that accompany the more severe storms cause erosion, injure plants, and probably do more damage than lightning. In spring or summer, the storms may be accompanied by hail, but generally only once or twice a year. The hailstones are seldom large enough or numerous enough to cause extensive damage. A few times, however, large hailstones have uncovered and bruised growing potatoes.

Wind and heavy rain from hurricanes rarely affect Southern Aroostook County. Tornadoes are more frequent, but most of them affect only a small area. Few people are injured, and property damage is not significant.

General Nature of the Area

This section tells something of the geography, settlement and development, transportation, agriculture, and other interesting facts about Aroostook County. It differs from other sections of the report in that it mainly concerns the entire county, although the writeup on settlement and development applies mostly to the southern part. Some information, such as U.S. Census statistics on population and agriculture, are available only for the county as a whole. By understanding the general nature of the entire county, one can better understand that of the area covered by this survey.

Geography

Aroostook County, which was originally part of Penobscot and Washington Counties, forms the northern and most of the eastern boundary of Maine. After Aroostook County was formed in 1839, parts of Piscataquis and Somerset Counties were added to it. The county covers an area of 6,805 square miles.

Aroostook is an important agricultural county, particularly for potatoes. It is called the potato empire, although less than one-fifth of the land is under

cultivation. The rest is roadless wilderness and is the most extensive such area east of the Mississippi River.

Aroostook County can be divided into four areas. Three of these are near the first settlements; the other is the wilderness area in the western part of the county.

1. The southernmost area centers around Houlton, the county seat and third largest community. In this area farmers practice a general type of agriculture. Potatoes are the cash crop, but less acreage per farm is in potatoes than in the area around Presque Isle, Caribou, and Fort Fairfield.
2. The most highly specialized potato-producing area is about 50 miles north of Houlton. This area, the last to be settled, occurs around Presque Isle, Caribou, and Fort Fairfield. Many of the potato-processing plants and marketing offices are located in this area, as well as the largest and most highly developed potato farms in the county.
3. The northernmost area is in the St. John Valley around Van Buren, Madawaska, and Fort Kent. Potatoes are grown in a one-crop system. Nevertheless, in this area there are fewer acres per farm in potatoes than in the area around Presque Isle, Caribou, and Fort Fairfield. Farmers supplement their incomes by working for lumbering concerns.
4. The western two-thirds of the county is forested, and many lumbering operations are carried on there.

Settlement and Development

Before 1800, when Maine was still part of Massachusetts, the Southern Aroostook area was thinly populated. In 1799, the Massachusetts Legislature granted land for the establishment of academies in what are now Houlton and Hodgdon. A few families arrived in the area in 1806, and more came after the War of 1812. In 1820, Maine became a State. Houlton was organized as a plantation in about 1826, and it was incorporated as a town in 1831.

In the early days, Houlton was connected by a road to Bangor, which is south of the area. Horses were used to haul manufactured products into the area and agricultural produce out. No roads connected Houlton with the settlements to the north, however.

After Maine became a State, the boundary between Maine and Canada was in dispute. Because of the possibility of hostilities, Maine militia were stationed in Houlton and some of the other communities. The boundary dispute was adjusted peaceably, and afterwards some of the soldiers settled permanently in the area.

The growth of the southern part of Aroostook County was slow until 1870, however. In 1871, the railroad joined Houlton and Bangor, and Houlton became a trading center for the area. With the coming of the railroad, potatoes and starch could be easily shipped to markets outside the county. Consequently, the growing of potatoes and the manufacture of starch increased in importance, and more people came into the area. The southern part of Aroostook County is now a well-developed agricultural area, although it is not densely populated. There are many agricultural communities and shopping centers but no large cities. In 1960, the population of Houlton was 5,976 and that of the entire county was 106,064.

Transportation

Railroads, highways, and a commercial airline provide transportation in Aroostook County.

In 1871, the European and North American Railway connected Houlton with markets to the south. By 1881, this line connected Fort Fairfield, Caribou, and Presque Isle with communities in New Brunswick, Canada. Fort Kent was originally served by a Canadian railroad. Goods had to be ferried from Clair Station, New Brunswick, to Fort Kent.

The Bangor and Aroostook Railroad, which opened in 1894, connected Caribou and Fort Fairfield with Houlton. By 1915, the railroad had been extended northward to Canada. The Aroostook Valley Railroad began to serve Presque Isle, Caribou, Washburn, New Sweden, and Crouseville in 1911. This railroad connects with the Canadian Pacific Railway at Presque Isle, and the first potato-storage houses in the county were erected along its lines.

At present the Bangor and Aroostook Railroad runs north through Masardis, Ashland, Eagle Lake, and Fort Kent in the western part of the agricultural area. A line of this railroad extends north along the eastern edge of the county. It connects Houlton, Mars Hill, Caribou, New Sweden, Stockholm, and Van Buren. Another line along the St. John River connects St. Francis and Van Buren. Branch lines serve Mapleton, Presque Isle, Fort Fairfield, and the smaller communities. Many of these places are also served by the Canadian Pacific Railroad.

In Aroostook County, two main highways extend north and south through the agricultural area, which is about 25 miles wide and 75 miles long. U.S. Highway No. 1 enters the county near Weston and extends nearly to the Canadian border. It goes through Houlton, Mars Hill, Presque Isle, Caribou, and Van Buren. At Van Buren it turns west and follows the St. John River through Madawaska to Fort Kent.

State Highway No. 11 enters Aroostook County at Hersey and extends north along the western side of the agricultural area through Ashland, Portage, Eagle Lake, and Fort Kent. State Highway No. 163, which extends from Ashland to Presque Isle, connects State Highway No. 11 with U.S. Highway No. 1.

State Highway No. 161 connects Caribou with Fort Kent and then extends west along the St. John River to Allagash. This is the only State highway that penetrates the forested wilderness in the western part of the county.

Large areas between State Highway No. 11 and U.S. Highway No. 1 are used only for forestry and are not crossed by public highways. However, there are logging roads, owned and maintained by lumber operators, in these areas, as well as in the wilderness to the west.

The most extensive network of roads in the county centers around Mars Hill, Fort Fairfield, Caribou, and Presque Isle. These roads provide easy access to New Brunswick, Canada.

Commercial airline service is available at Presque Isle.

Natural Resources

The forests are the principal natural resource of Aroostook County, and about 82 percent of the area is still forested. Most of the wood is used to manufacture paper,

but many thousands of board feet of pine and spruce lumber are harvested each year.

The many streams and lakes in the county were used by early settlers for transportation. Highways and railroads now provide most of the transportation needs, but streams still transport pulpwood. In some places, especially on the Aroostook River at Caribou, electricity is generated by waterpower.

Industries

Agricultural and forest products are processed and manufactured in Aroostook County.

Most of the potato-starch factories in the United States are located in the county. A starch factory was built in Caribou in 1871, and by 1890, there were 42 starch factories within the county. When prices for potatoes are low, much of the crop is sold for making starch. Consequently, production of starch fluctuates from year to year, depending on the demand for potatoes.

Paper products are manufactured at Madawaska. A lumber company at Ashland processes quality pine lumber. This is one of the largest operations of its kind in Maine. In the basins of the upper parts of the St. John and Allagash Rivers, lumbering operations are carried on by men from the nearby towns.

Frozen peas and french-fried potatoes and other potato products are processed at Caribou and Washburn.

Fertilizer plants are located at Houlton, Mars Hill, Presque Isle, Caribou, and Fort Kent.

Community Facilities

Elementary and secondary schools are located conveniently throughout the county. Ricker College in Houlton offers degrees in arts and sciences and also provides preprofessional and vocational curriculums. Aroostook State Normal School at Presque Isle and Madawaska Training School at Fort Kent provide the first 3 years of a 4-year course in teachers' training. The Madigan Hospital in Houlton offers a 3-year program in nurses' training.

Nearly all communities in the county have telephone service. Electricity is available in all except the most remote areas. Radio stations are located at Houlton, Presque Isle, and Caribou. There is a television station in Presque Isle.

Recreation Facilities

Aroostook County offers excellent facilities for hunting, fishing, hiking, and canoeing. Many small streams along State Highway No. 11 can be fished from the roadbanks. These streams are spawning and feeding grounds for trout.

Logging roads that run east and west provide access to many lakes where the allowed limit of salmon and togue can be caught. Many lakes that lie as much as 25 miles in the wilderness can be reached by logging trails off of State Highway No. 11. A few isolated lakes can be reached by pontoon planes based at Portage Lake.

A guided canoe trip of 150 miles can be taken from Greenville, which is south of the county, to Allagash. Canoe trips can also be made up the St. John River in the far western part of the county.

Deer, bear, bobcat, and ruffed grouse are plentiful throughout the county. Hunting of deer and grouse is good, even in the more thickly settled areas. Bear hunting is done in the larger wooded areas.

Agriculture

The first part of this section consists of a brief discussion of early agriculture in the county, and the second, of a more detailed discussion of present agriculture.

Early agriculture

Part-time agriculture was practiced by early lumbermen, who produced their own food and also hay for livestock. Fields were not cleared for potatoes until 1871, when the first potato-starch factory was erected. A railroad began operation in the same year and shipped 4,000 bushels of potatoes out of the county. By 1891, annual shipments had increased to 3,000,000 bushels of potatoes, in addition to 10,000 tons of hay.

Between 1880 and 1890, the acreage in potatoes doubled; an estimated 28,000 acres produced 5,000,000 bushels of potatoes in 1890. About 1,500,000 bushels were manufactured into starch. Because of the demand created by World War II, approximately 172,000 acres were in potatoes by 1943.

Present agriculture

The statistics in this section are taken from the U.S. Census reports for 1959, unless otherwise specified, and apply to the entire county.

About 15 percent of the total acreage of the county was in farms in 1959. There were an estimated 3,057 farms containing a total of 662,841 acres. The land in farms consisted of 328,437 acres of cropland, 16,481 acres of pasture (not cropland and not woodland), 283,620 acres of woodland, and 34,303 acres of other land (house lots, roads, wasteland, etc.).

The estimated 3,057 farms in the county were grouped by type as follows:

	Number of farms
Field crop (potato)	2,340
Cash-grain	10
Dairy	193
Poultry	32
Livestock (other than dairy and poultry)	20
General	5
Miscellaneous and unclassified	457

In 1959, a total of 2,384 farms were 100 or more acres in size, and 461 were between 50 and 99 acres. About 7 percent of the farms were between 1 and 49 acres. The average size of farms was 216.8 in 1959, compared to 182.2 acres in 1950. The number of farms has decreased in recent years. There were an estimated 4,614 farms in 1950, but only 3,057 in 1959.

The acreage used for important crops in 1959 was as follows:

	Number of acres
Oats harvested	46,653
Wheat harvested	310
Buckwheat harvested	772
Hay crops, total	42,417
Irish potatoes harvested for home use or for sale	125,126
Green peas harvested for sale	4,381

The number of livestock on farms in the county in 1959 was as follows:

	Number
Steers and bulls	2,715
Dairy cattle	9,812
Hogs and pigs	5,147
Sheep and lambs	7,695
Chickens (4 months old and over)	290,036

Most of the farms in Aroostook County are operated by owners. In 1959, a total of 2,488 farms were operated by owners, 442 by part owners, 13 by managers, and 114 by tenants.

A total of 5,649 tractors and 5,145 motortrucks were reported on 2,730 farms, and 3,434 automobiles, on 2,784 farms.

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Glossary

Aeration, soil. The process by which air and other gases in the soil are renewed. The rate of soil aeration depends largely on the size and number of pores in the soil and on the amount of water clogging the pores.

Aggregate, soil. A single mass or cluster consisting of many primary soil particles held together, such as a prism, crumb, or granule.

Alluvial soil. Soil formed from material, such as gravel, sand, silt, or clay, deposited by a stream of water and showing little or no modification of the original materials by soil-forming processes.

Base saturation. The relative degree to which a soil has absorbed metallic cations (calcium, potassium, magnesium, etc.). The proportion of the cation-exchange capacity that is saturated with metallic cations.

Bisequal (profile). A profile that contains both an upper and a lower sequence (sequum) of horizons. In the lower sequum, the horizon designations have a prime accent, such as A′2 and B′2.

Bleicherde. The principal gray or light-colored leached layer (A2) in Podzols.

Bulk density. The mass or weight of oven-dry soil per unit bulk volume, including air space.

Calcareous. Containing calcium carbonate or lime.

Coarse-textured soil. A sandy soil consisting of sand or loamy sand. A moderately coarse textured soil consists of sandy loam or fine sandy loam.

Conglomerate. Rock composed of gravel and rounded stones cemented together by hardened clay, lime, iron oxide, or silica.

Consistence. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are as follows:

Loose.—Noncoherent; will not hold together in a mass.

Friable.—When moist, crushes easily under moderate pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a wire when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material.

Hard.—When dry, moderately resistant to pressure; can barely be broken between thumb and forefinger.

Cemented.—Hard and brittle; little affected by moistening.

Contour farming. Plowing, planting, cultivating, and harvesting in rows that are at right angles to the natural direction of the slope and as nearly level as practical.

Cover crops. Close-growing crops grown primarily to improve the soil and protect it between periods of regular crop production; or crops grown between trees in orchards.

Diversion terrace. A channel, with a supporting ridge on the lower side constructed across the slope to intercept runoff and carry it to a planned outlet. The terrace is maintained in permanent sod.

Drainage terrace. A relatively deep channel and low ridge constructed across the slope, primarily for drainage. It may be either a diversion terrace or a field terrace.

Eluvial horizon. A horizon from which material dissolved or suspended in water is removed.

Erodible. Susceptible to erosion; easily lost through the action of water or wind.

Erosion. The wearing away of the surface of the soil by running water, wind, or other geological agencies.

Geological erosion.—Normal erosion that takes place when soil is under native vegetation and undisturbed by human activity

Sheet erosion.—Gradual and uniform removal of soil material from the surface of the soil without the formation of rills and gullies.

Fine-textured soil. A soil consisting predominantly of silt and clay; a sandy clay, silty clay, or clay. A moderately fine textured soil is a clay loam, sandy clay loam, or silty clay loam.

Flood plain. A nearly level area, subject to overflow, that occurs along streams.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, covered with grasses that will protect the

soil from erosion, and used to conduct surface water away from cropland.

Green-manure crop. A crop of grasses or legumes worked into the soil while green or soon after maturity for the purpose of soil improvement.

Hardpan. A horizon, or soil layer, that is strongly compacted or cemented.

Horizon, soil. A layer of soil, approximately parallel to the soil surface, with distinct characteristics produced by soil-forming processes. Horizons are identified by letters of the alphabet.

A horizon.—The horizon at the surface. It contains organic matter, or it has been leached of soluble minerals and clay, or it shows the effects of both. The major A horizon may be subdivided into A1, the part that is darkest in color because it contains organic matter, and A2, the part that is the most leached and light-colored layer in the profile. In woodland, a layer of organic matter accumulates on top of the mineral soil; this layer is called the A0 horizon. The depth of the soil, however, is measured from the top of the mineral soil, because the A0 horizon is rapidly destroyed if fire occurs or if the soil is cultivated. Where the upper part of the soil is thoroughly mixed by cultivation, this plow layer is called the Ap horizon.

B horizon.—The horizon in which clay, minerals, or other material has accumulated, or which has developed a characteristic blocky or prismatic structure, or which shows the characteristics of both processes. It may be subdivided into B1, B2, or B3 horizons. The B2 horizon may be subdivided further, and this is shown by adding a number to the symbol, such as B21 or B22.

C horizon.—The unconsolidated material immediately under the true soil. It is presumed to be similar in chemical, physical, and mineral composition to the material from which at least part of the overlying solum has developed.

D horizon.—The stratum beneath the parent material. It may be unlike the parent material of the soil. If it consists of solid rock like that from which the parent material has developed, it is designated as Dr.

Gleyed horizon.—A strongly mottled or gray horizon that occurs in wet soils. It is designated by the symbols Bg or Cg.

Igneous rock. A rock produced through the cooling of melted mineral materials.

Illuvial horizon. A soil horizon (the B) that contains an accumulation of mineral and organic matter originating from horizons above.

Leached layer. A layer in which the soluble constituents have been dissolved and washed away by the percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state. In engineering, a high liquid limit indicates that the soil has a high content of clay and a low capacity for carrying loads.

Medium-textured soil. A loamy soil—a very fine sandy loam, loam, silt loam, or silt.

Mottling, soil. Contrasting color patches that vary in number and size. Descriptive terms are as follows: Contrast—*faint*, *distinct*, and *prominent*; abundance—*few*, *common*, and *many*; and size—*fine*, *medium*, and *coarse*. The size measurements are the following: Fine, less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; medium, ranging from 5 to 15 millimeters (about 0.2 to 0.6 inch) in diameter; and coarse, more than 15 millimeters (about 0.6 inch) in diameter.

Orterde. Horizons that have accumulations of iron and organic matter but which are not cemented.

Ped. A soil aggregate; the natural structural pieces into which the soil tends to separate when disturbed.

Permeability. That quality of the soil that enables it to transmit water or air. Terms used to describe permeability are *very slow*, *slow*, *moderately slow*, *moderate*, *moderately rapid*, *rapid*, and *very rapid*.

Phyllite. A micaceous schist, intermediate between mica-schist and slate.

Plastic limit. The moisture content at which a soil changes from a semisolid to a plastic state.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range in moisture content over which the soil remains plastic.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of the soil expressed in pH values or in words, as follows:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher.
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Residual soil. Soil formed in place by the disintegration and decomposition of rocks and the consequent weathering of the mineral materials. Presumably developed from the same kind of rock as that on which it lies.

Sedimentary rock. A rock composed of particles deposited from suspension in water. Although there are many intermediate types, the principal groups of sedimentary rocks are (1) conglomerate (from gravel), (2) sandstone (from sand), (3) shale (from clay), and (4) limestone (from calcium carbonate deposits).

Shale. A sedimentary rock formed by hardening of clay deposits into rock.

Shaly. Containing flat fragments of shale less than 6 inches long.

Solum. The upper part of the soil profile, above the parent material; the part of the profile that has been noticeably affected by the soil-forming processes. The solum of mature soils consists of the A and B horizons.

Stripcropping. Using alternate strips of close-growing crops and of clean-tilled crops or fallow, on the contour or parallel to terraces.

Structure, soil. The arrangement of the primary soil particles into lumps, granules, or other aggregates. Structure is described by grade—*weak*, *moderate*, or *strong*, that is, the distinctness and durability of the aggregates; by the size of the aggregates—*very fine or very thin*, *fine or thin*, *medium*, *coarse or thick*, *or very coarse or very thick;* and by their shape—*platy*, *prismatic*, *blocky* (angular or subangular), *columnar*, *crumb*, or *granular*. A soil is described as *structureless* if there are no observable aggregates. Structureless soils may be *massive* (coherent) or *single grain* (noncoherent).

Blocky, subangular.—Aggregates have some rounded and some flat surfaces; upper sides are rounded.

Columnar.—Aggregates are prismatic and are rounded at the top.

Crumb.—Aggregates are generally soft, small, porous, and irregular, but tend toward a spherical shape.

Granular.—Aggregates are roughly spherical, firm, and small. They may be either hard or soft but are generally more firm and less porous than those of crumb structure and without the distinct faces of blocky structure.

Platy.—Aggregates are flaky or platelike.

Prismatic.—Aggregates have flat vertical surfaces, and their height is greater than their width.

Subsoil. The soil layers below the plow layer; the B horizon.

Substratum. The soil material below the surface soil and the subsoil; the C or D horizon.

Surface runoff. Rainwater or melted snow that flows away over the surface of the soil without sinking in.

Surface soil (plow layer). The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches thick.

Texture, soil. The relative amounts of particles of different size classes, called *clay*, *silt*, and *sand*, determine texture. The common soil textures in Southern Aroostook County are gravelly loam, loam, and silt loam. Each of these textural classes covers a given range in content of clay, silt, and sand.

Clay.—Small mineral soil grains, less than 0.002 millimeter (0.000079 inch) in diameter.

Silt.—Small mineral soil grains ranging from 0.002 millimeter (0.000079 inch) to 0.05 millimeter (0.002 inch) in diameter.

Sand.—Small rock or mineral fragments ranging from 0.05 millimeter (0.002 inch) to 2.0 millimeters (0.079 inch) in diameter.

Tilth. The physical properties of the soil that affect the ease of cultivating it or its suitability for crops.

Topsoil. Soil material containing organic matter and suitable as a surfacing for shoulders and slopes.

Water-holding capacity. The ability of a soil to hold water that will not drain away but can be taken up by plant roots.

Water table. The upper surface of the ground water.

GUIDE TO MAPPING UNITS, CAPABILITY UNITS, AND WOODLAND SUITABILITY GROUPS

[See table 1, p. 11, for estimated average acre yields of crops; table 4, p. 20, and table 5, p. 24, for information about engineering properties of the soils; and table 6, p. 29, for approximate acreage and proportionate extent of the soils]

Map symbol	Soil	Page	Capability unit		Woodland group	
			Symbol	*Page*	*Number*	*Page*
CgA	Caribou gravelly loam, 0 to 2 percent slopes	31	IIc-3	5	1	13
CgB	Caribou gravelly loam, 2 to 8 percent slopes	31	IIe-3	6	1	13
CgC	Caribou gravelly loam, 8 to 15 percent slopes	32	IIIe-3	7	1	13
CgD	Caribou gravelly loam, 15 to 25 percent slopes	32	IVe-3	8	1	13
CgE	Caribou gravelly loam, 25 to 45 percent slopes	32	VIe-3	9	1	13
CnA	Colton gravelly sandy loam, dark materials, 0 to 2 percent slopes	33	IIs-5	7	3	13
CnB	Colton gravelly sandy loam, dark materials, 2 to 8 percent slopes	33	IIs-5	7	3	13
CnC	Colton gravelly sandy loam, dark materials, 8 to 15 percent slopes	33	IIIes-5	8	3	13
CnD	Colton gravelly sandy loam, dark materials, 15 to 25 percent slopes	33	IVes-5	8	3	13
CnE	Colton gravelly sandy loam, dark materials, 25 to 45 percent slopes	33	VIIes-5	10	3	13
CoA	Conant silt loam, 0 to 2 percent slopes	34	IIw-4	6	2	13
CoB	Conant silt loam, 2 to 8 percent slopes	34	IIw-4	6	2	13
CoC	Conant silt loam, 8 to 15 percent slopes	34	IIIew-4	8	2	13
DaA	Daigle silt loam, 0 to 2 percent slopes	35	IIw-4	6	2	13
DaB	Daigle silt loam, 2 to 8 percent slopes	35	IIw-4	6	2	13
DaC	Daigle silt loam, 8 to 15 percent slopes	35	IIIew-4	8	2	13
Ha	Hadley silt loam	36	IIc-6	5	1	13
HoA	Howland gravelly loam, 0 to 2 percent slopes	36	IIw-4	6	2	13
HoB	Howland gravelly loam, 2 to 8 percent slopes	37	IIw-4	6	2	13
HoC	Howland gravelly loam, 8 to 15 percent slopes	37	IIIew-4	8	2	13
HvB	Howland very stony loam, 0 to 8 percent slopes	37	VIs-3	9	2	13
HvC	Howland very stony loam, 8 to 15 percent slopes	37	VIs-3	9	2	13
LnB	Linneus silt loam, 0 to 8 percent slopes	38	IIe-3	6	4	13
LnC	Linneus silt loam, 8 to 15 percent slopes	38	IIIe-3	7	4	13
LnD	Linneus silt loam, 15 to 35 percent slopes	38	IVe-3	8	4	13
MaA	Machias gravelly loam, 0 to 2 percent slopes	39	IIw-5	7	2	13
MaB	Machias gravelly loam, 2 to 8 percent slopes	39	IIw-5	7	2	13
MaC	Machias gravelly loam, 8 to 15 percent slopes	39	IIIew-5	8	2	13
Md	Made land	39	([1])	--	([1])	--
MhB	Mapleton shaly silt loam, 0 to 8 percent slopes	40	IIe-1	6	4	13
MhC	Mapleton shaly silt loam, 8 to 15 percent slopes	40	IIIe-1	7	4	13
MhD	Mapleton shaly silt loam, 15 to 35 percent slopes	40	IVe-1	8	4	13
MmC	Mapleton very rocky silt loam, 0 to 15 percent slopes	40	VIs-1	9	4	13
MmD	Mapleton very rocky silt loam, 15 to 35 percent slopes	41	VIIs-1	10	4	13
Mn	Mixed alluvial land	41	VIw-6	9	5	14
MoA	Monarda and Burnham silt loams, 0 to 2 percent slopes	41	IVw-3	9	5	14
MoB	Monarda and Burnham silt loams, 2 to 8 percent slopes	42	IVw-3	9	5	14
MrB	Monarda and Burnham very stony silt loams, 0 to 8 percent slopes	42	VIIsw-3	10	5	14
Pa	Peat and muck	42	VIIw-9	10	6	14
PeA	Perham gravelly silt loam, 0 to 2 percent slopes	43	IIc-3	5	1	13
PeB	Perham gravelly silt loam, 2 to 8 percent slopes	43	IIe-3	6	1	13
PeC	Perham gravelly silt loam, 8 to 15 percent slopes	43	IIIe-3	7	1	13
PeD	Perham gravelly silt loam, 15 to 25 percent slopes	43	IVe-3	8	1	13
PgB	Plaisted gravelly loam, 0 to 8 percent slopes	44	IIe-3	6	1	13
PgC	Plaisted gravelly loam, 8 to 15 percent slopes	44	IIIe-3	7	1	13
PgD	Plaisted gravelly loam, 15 to 25 percent slopes	44	IVe-3	8	1	13
PrB	Plaisted very stony loam, 0 to 8 percent slopes	45	VIs-3	9	1	13
PrC	Plaisted very stony loam, 8 to 15 percent slopes	45	VIs-3	9	1	13
PrD	Plaisted very stony loam, 15 to 25 percent slopes	45	VIs-3	9	1	13
PrE	Plaisted very stony loam, 25 to 45 percent slopes	45	VIIs-3	10	1	13
PvB	Plaisted and Howland very stony loams, 0 to 8 percent slopes	45	VIs-3	9	1	13
PvC	Plaisted and Howland very stony loams, 8 to 15 percent slopes	45	VIs-3	9	1	13
RaA	Red Hook and Atherton silt loams, 0 to 2 percent slopes	46	IVw-5	9	5	14
RaB	Red Hook and Atherton silt loams, 2 to 8 percent slopes	46	IVw-5	9	5	14
SgA	Stetson gravelly loam, 0 to 2 percent slopes	46	IIc-5	5	3	13
SgB	Stetson gravelly loam, 2 to 8 percent slopes	46	IIe-5	6	3	13
ThB	Thorndike shaly silt loam, 0 to 8 percent slopes	47	IIe-1	6	4	13
ThC	Thorndike shaly silt loam, 8 to 15 percent slopes	47	IIIe-1	7	4	13
ThD	Thorndike shaly silt loam, 15 to 25 percent slopes	48	IVe-1	8	4	13
ThE	Thorndike shaly silt loam, 25 to 45 percent slopes	48	VIIs-1	10	4	13
TkB	Thorndike very rocky silt loam, 0 to 8 percent slopes	48	VIs-1	9	4	13
TkC	Thorndike very rocky silt loam, 8 to 15 percent slopes	48	VIs-1	9	4	13
TkD	Thorndike very rocky silt loam, 15 to 25 percent slopes	48	VIIs-1	10	4	13
TkE	Thorndike very rocky silt loam, 25 to 45 percent slopes	48	VIIs-1	10	4	13
TsB	Thorndike and Howland soils, 0 to 8 percent slopes	49	VIs-3	9	4	13
TsC	Thorndike and Howland soils, 8 to 15 percent slopes	49	VIs-3	9	4	13
Wn	Winooski silt loam	49	IIw-6	7	2	13

[1] Not placed in a capability unit or a woodland suitability group.

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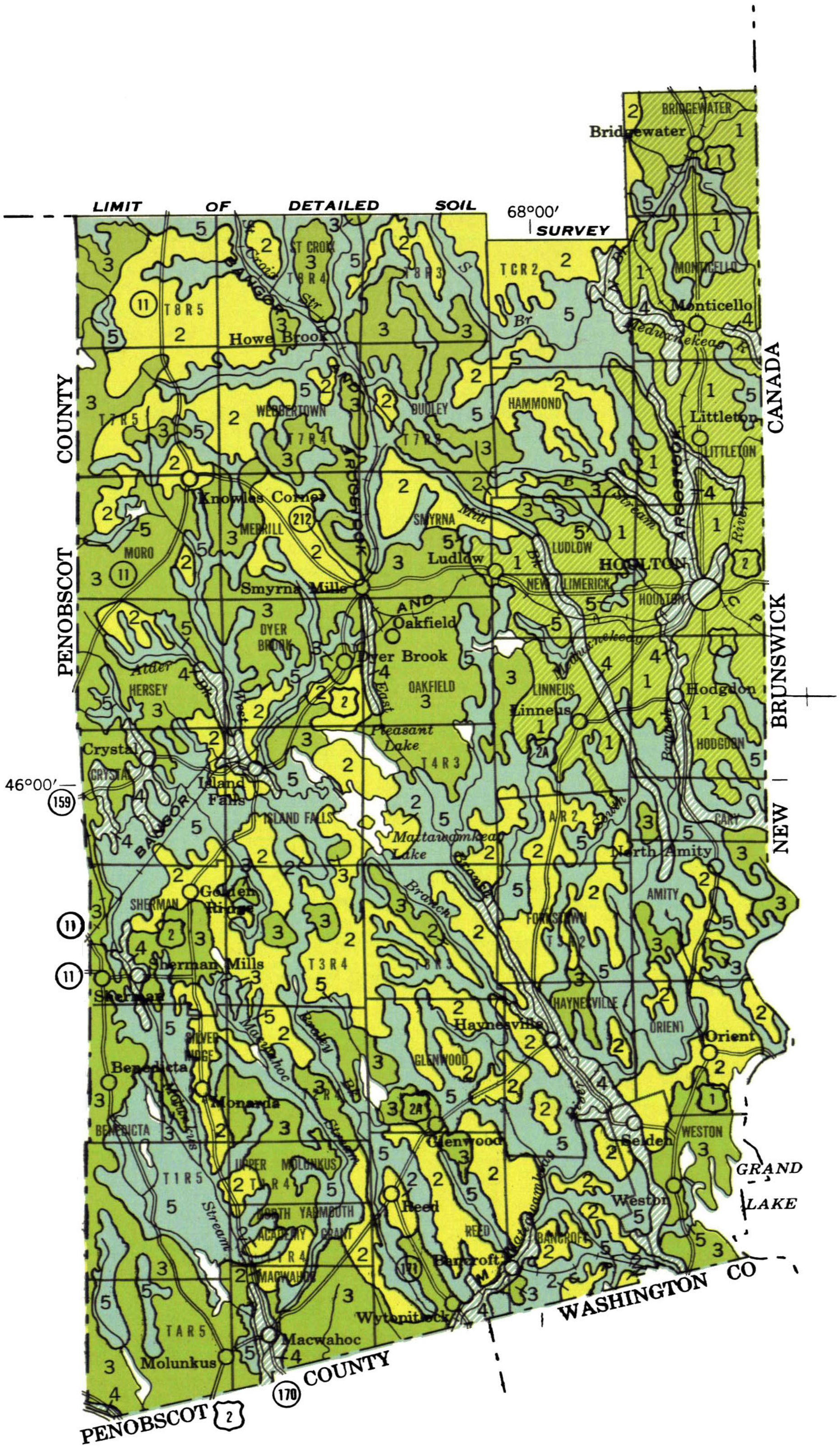
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
MAINE AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP
AROOSTOOK COUNTY, MAINE, SOUTHERN PART

N



SOIL ASSOCIATIONS

1	Caribou-Mapleton-Conant association: Gently rolling soils on till derived chiefly from limestone
2	Plaisted-Perham-Howland association: Smoothly sloping soils on till derived chiefly from acid rocks
3	Thorndike-Howland association: Irregularly sloping soils on till derived chiefly from acid rocks
4	Colton-Machias association: Nearly level to sloping soils on terraces, eskers, and glacial outwash
5	Monarda-Burnham association: Nearly level to gently sloping, poorly drained soils on firm till

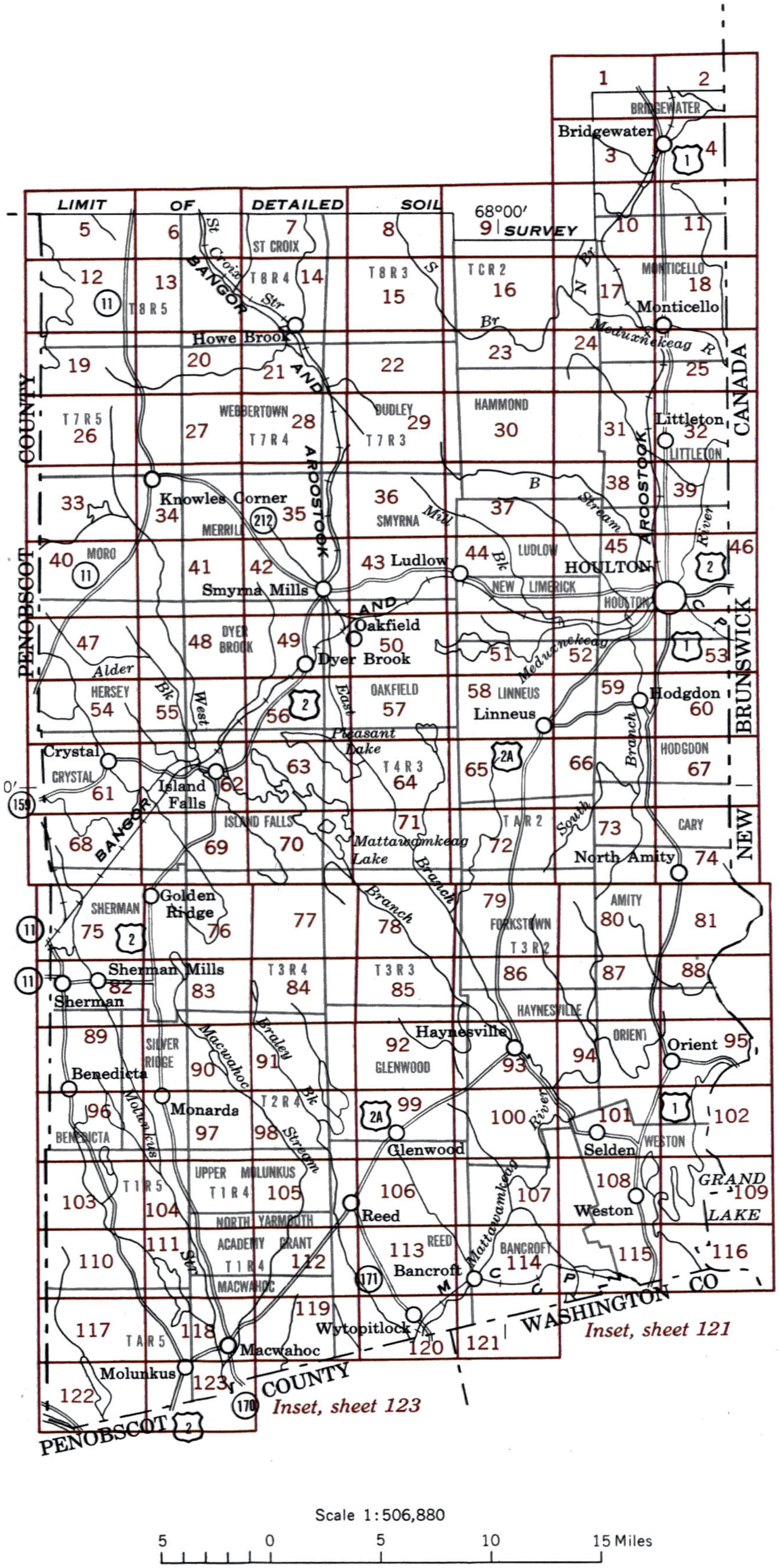
August 1963

Scale 1:506,880

5 0 5 10 15 Miles

INDEX TO MAP SHEETS

AROOSTOOK COUNTY, MAINE, SOUTHERN PART



SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter A, B, C, D, or E, shows the slope. Symbols for miscellaneous land types do not have a letter indicating slope. Mixed alluvial land, and Peat and muck are nearly level. Made land has a considerable range of slope.

SYMBOL	NAME
CgA	Caribou gravelly loam, 0 to 2 percent slopes
CgB	Caribou gravelly loam, 2 to 8 percent slopes
CgC	Caribou gravelly loam, 8 to 15 percent slopes
CgD	Caribou gravelly loam, 15 to 25 percent slopes
CgE	Caribou gravelly loam, 25 to 45 percent slope
CnA	Colton gravelly sandy loam, dark materials, 0 to 2 percent slopes
CnB	Colton gravelly sandy loam, dark materials, 2 to 8 percent slopes
CnC	Colton gravelly sandy loam, dark materials, 8 to 15 percent slopes
CnD	Colton gravelly sandy loam, dark materials, 15 to 25 percent slopes
CnE	Colton gravelly sandy loam, dark materials, 25 to 45 percent slopes
CoA	Conant silt loam, 0 to 2 percent slopes
CoB	Conant silt loam, 2 to 8 percent slopes
CoC	Conant silt loam, 8 to 15 percent slopes
DaA	Daigle silt loam, 0 to 2 percent slopes
DaB	Daigle silt loam, 2 to 8 percent slopes
DaC	Daigle silt loam, 8 to 15 percent slopes
Ha	Hadley silt loam
HoA	Howland gravelly loam, 0 to 2 percent slopes
HoB	Howland gravelly loam, 2 to 8 percent slopes
HoC	Howland gravelly loam, 8 to 15 percent slopes
HvB	Howland very stony loam, 0 to 8 percent slopes
HvC	Howland very stony loam, 8 to 15 percent slopes
LnB	Linneus silt loam, 0 to 8 percent slopes
LnC	Linneus silt loam, 8 to 15 percent slopes
LnD	Linneus silt loam, 15 to 35 percent slopes
MaA	Machias gravelly loam, 0 to 2 percent slopes
MaB	Machias gravelly loam, 2 to 8 percent slopes
MaC	Machias gravelly loam, 8 to 15 percent slopes
Md	Made land
MhB	Mapleton shaly silt loam, 0 to 8 percent slopes
MhC	Mapleton shaly silt loam, 8 to 15 percent slopes
MhD	Mapleton shaly silt loam, 15 to 35 percent slopes
MmC	Mapleton very rocky silt loam, 0 to 15 percent slopes
MmD	Mapleton very rocky silt loam, 15 to 35 percent slopes
Mn	Mixed alluvial land
MoA	Monarda and Burnham silt loams, 0 to 2 percent slopes
MoB	Monarda and Burnham silt loams, 2 to 8 percent slopes
MrB	Monarda and Burnham very stony silt loams, 0 to 8 percent slopes
Pa	Peat and muck
PeA	Perham gravelly silt loam, 0 to 2 percent slopes
PeB	Perham gravelly silt loam, 2 to 8 percent slopes
PeC	Perham gravelly silt loam, 8 to 15 percent slopes
PeD	Perham gravelly silt loam, 15 to 25 percent slopes
PgB	Plaisted gravelly loam, 0 to 8 percent slopes
PgC	Plaisted gravelly loam, 8 to 15 percent slopes
PgD	Plaisted gravelly loam, 15 to 25 percent slopes
PrB	Plaisted very stony loam, 0 to 8 percent slopes
PrC	Plaisted very stony loam, 8 to 15 percent slopes
PrD	Plaisted very stony loam, 15 to 25 percent slopes
PrE	Plaisted very stony loam, 25 to 45 percent slopes
PvB	Plaisted and Howland very stony loams, 0 to 8 percent slopes
PvC	Plaisted and Howland very stony loams, 8 to 15 percent slopes
RaA	Red Hook and Atherton silt loams, 0 to 2 percent slopes
RaB	Red Hook and Atherton silt loams, 2 to 8 percent slopes
SgA	Stetson gravelly loam, 0 to 2 percent slopes
SgB	Stetson gravelly loam, 2 to 8 percent slopes
ThB	Thorndike shaly silt loam, 0 to 8 percent slopes
ThC	Thorndike shaly silt loam, 8 to 15 percent slopes
ThD	Thorndike shaly silt loam, 15 to 25 percent slopes
ThE	Thorndike shaly silt loam, 25 to 45 percent slopes
TkB	Thorndike very rocky silt loam, 0 to 8 percent slopes
TkC	Thorndike very rocky silt loam, 8 to 15 percent slopes
TkD	Thorndike very rocky silt loam, 15 to 25 percent slopes
TkE	Thorndike very rocky silt loam, 25 to 45 percent slopes
TsB	Thorndike and Howland soils, 0 to 8 percent slopes
TsC	Thorndike and Howland soils, 8 to 15 percent slopes
Wn	Winooski silt loam

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Dual
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail, foot
- Railroad
- Ferries
- Ford
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings

School

Church

Station

Mines and Quarries

Mine dump

Pits, gravel or other

Power lines

Pipe lines

Cemeteries

Dams

Levees

Tanks

Oil wells

Windmills

Canal locks (point upstream)

BOUNDARIES

- National or state
- County
- Township, U. S.
- Section line, corner
- Reservation
- Land grant
- Township, civil

DRAINAGE

Streams
- Perennial
- Intermittent, unclass.

Canals and ditches — CANAL, DITCH

Lakes and ponds
- Perennial
- Intermittent

Wells — flowing

Springs

Marsh

Wet spot

RELIEF

Escarpments
- Bedrock
- Other

Prominent peaks

Depressions (Large, Small)
- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

SOIL SURVEY DATA

- Soil boundary and symbol — Dx
- Gravel
- Stones
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gullies
- Wind erosion, moderate
- Wind erosion, severe
- Wind hummock
- Overblown soil

Areas of alkali and salts
- Strong — A
- Moderate — M
- Slight — S
- Free of toxic effect — F

Sample location — 26

Saline spot

Soil map constructed 1963 by Cartographic Division, Soil Conservation Service, USDA. Controlled mosaic based on Maine plane coordinate system, east zone, transverse Mercator projection. 1927 North American datum.

0 ½ 1 Mile Scale 1: 20000 0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

2

N

(Joins sheet 1)

(Joins sheet 4)

Scale 1:20000

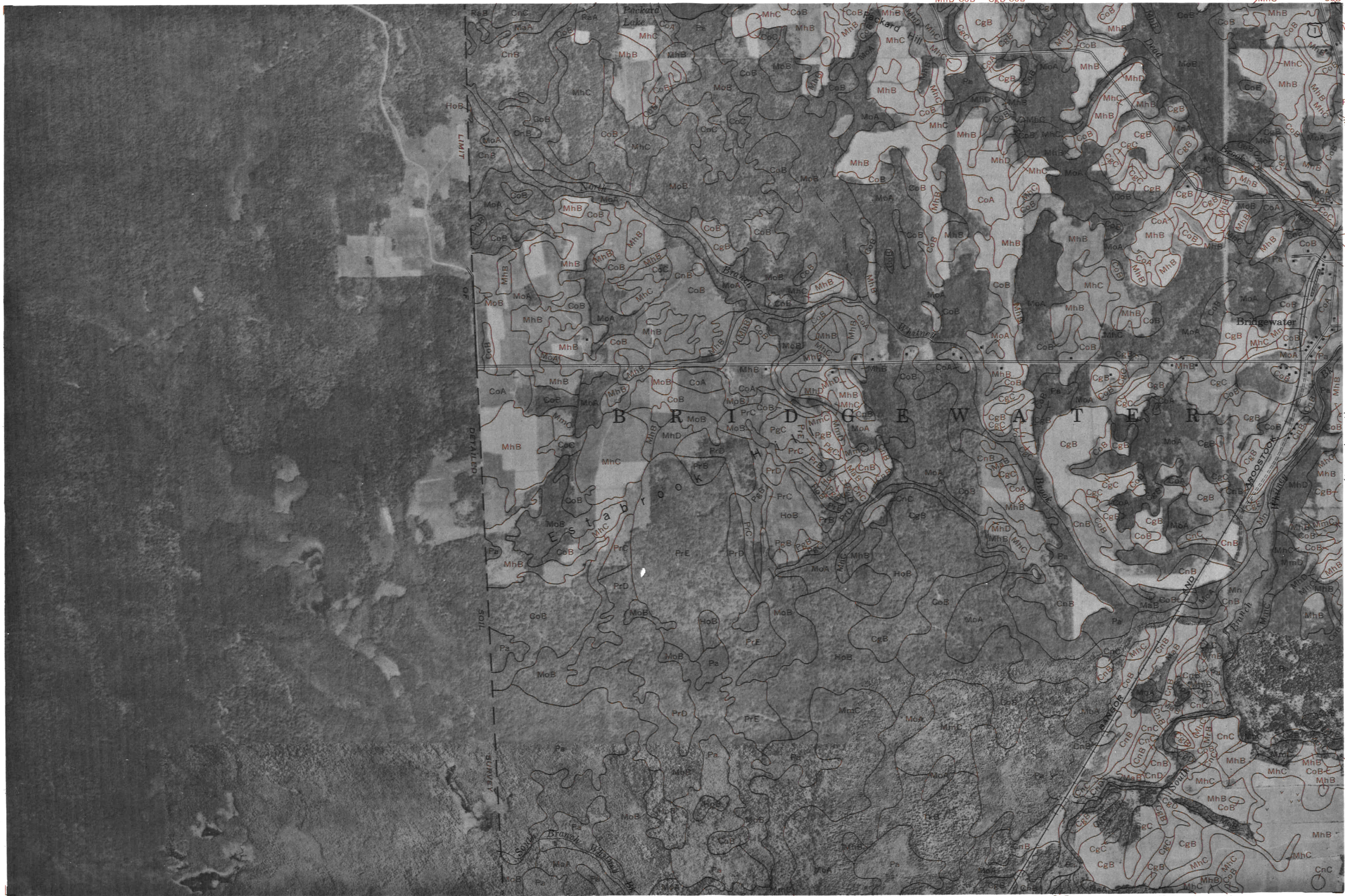
0 ½ 1 Mile

0 5000 Feet

AROOSTOOK COUNTY, MAINE, SOUTHERN PART — SHEET NUMBER 3

3

(Joins sheet 1)



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(Joins sheet 10)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

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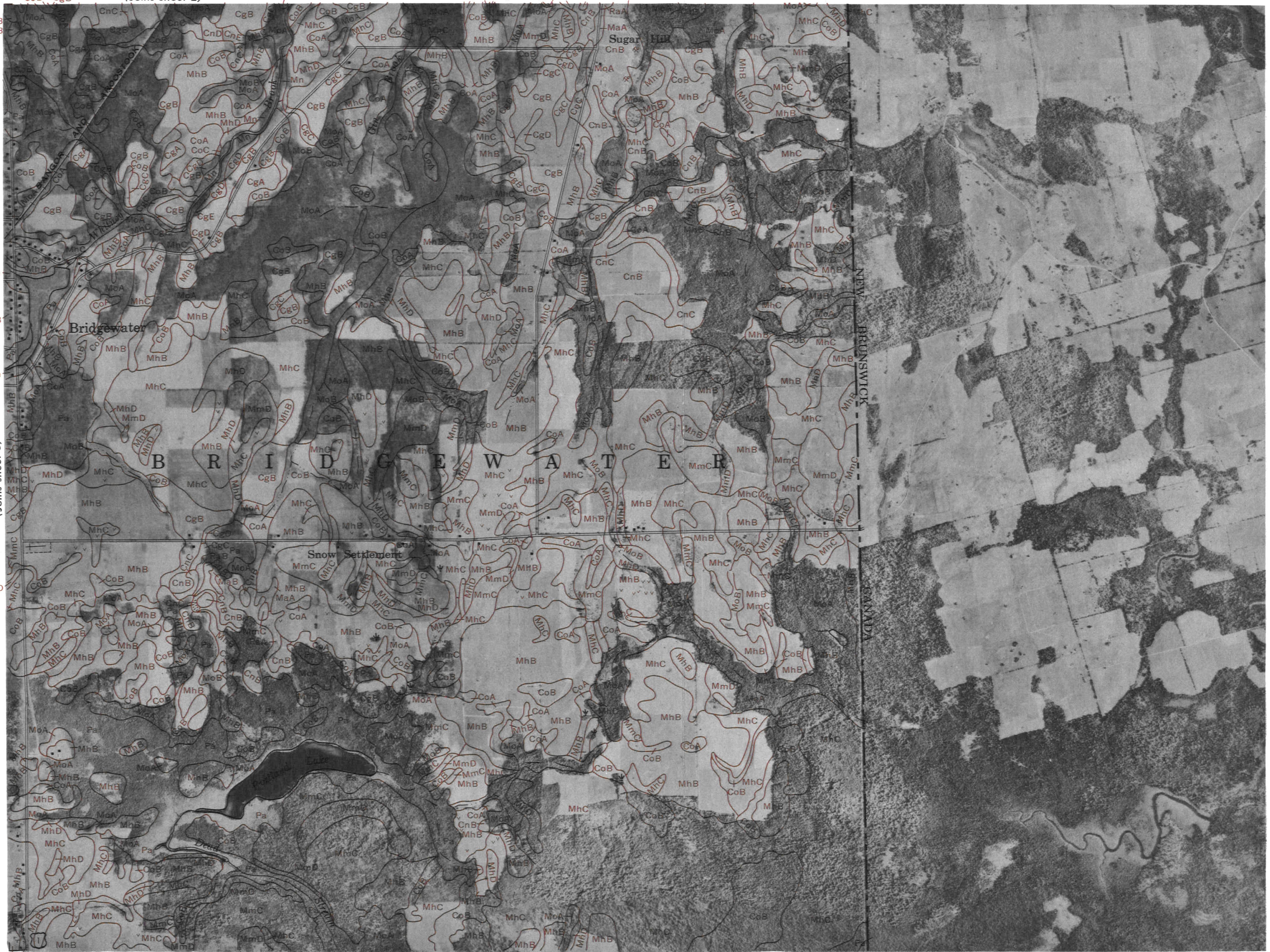
4

(Joins sheet 2)

(Joins sheet 3)



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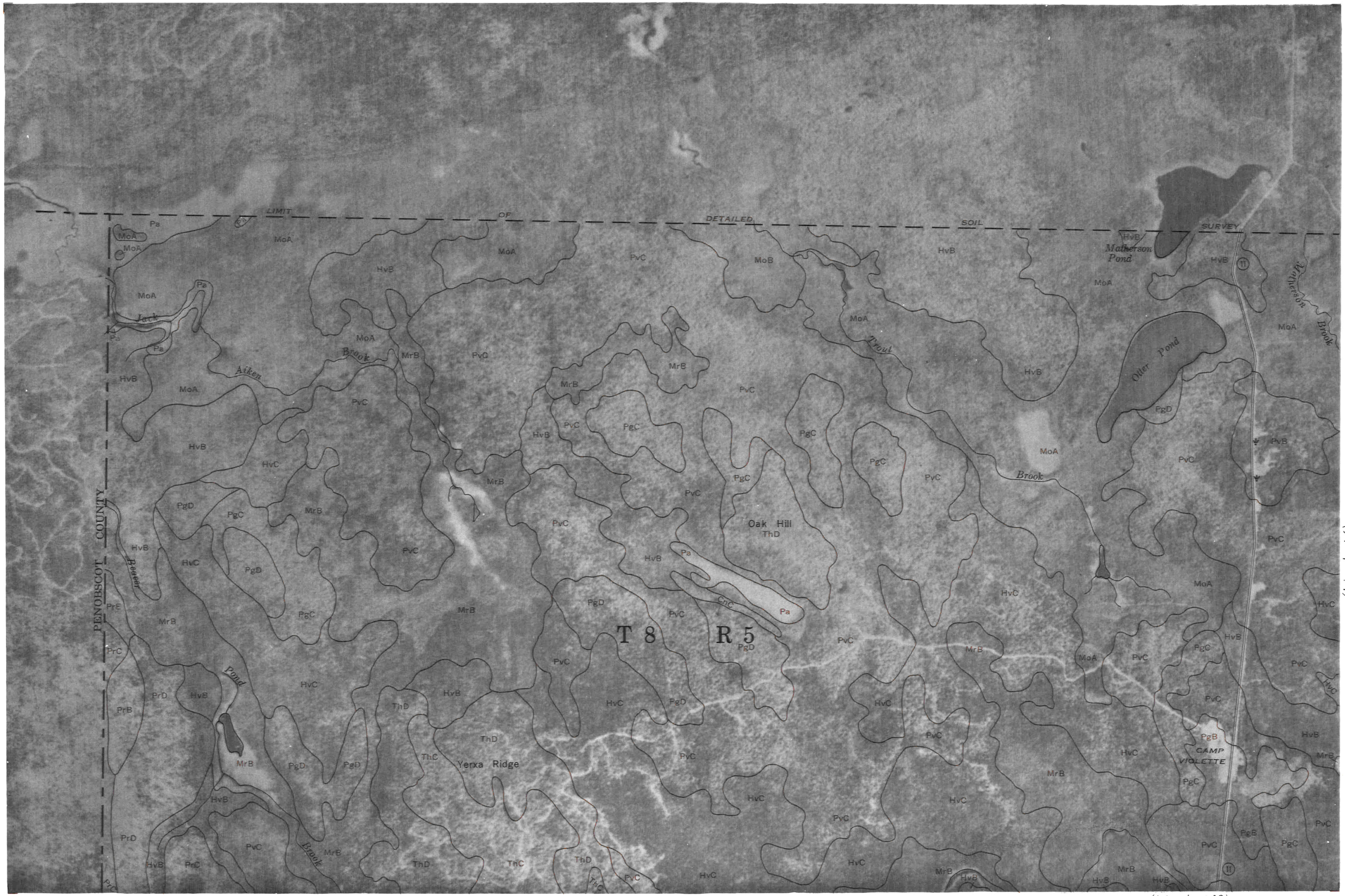

and the Maine Agricultural Experiment Station.

6

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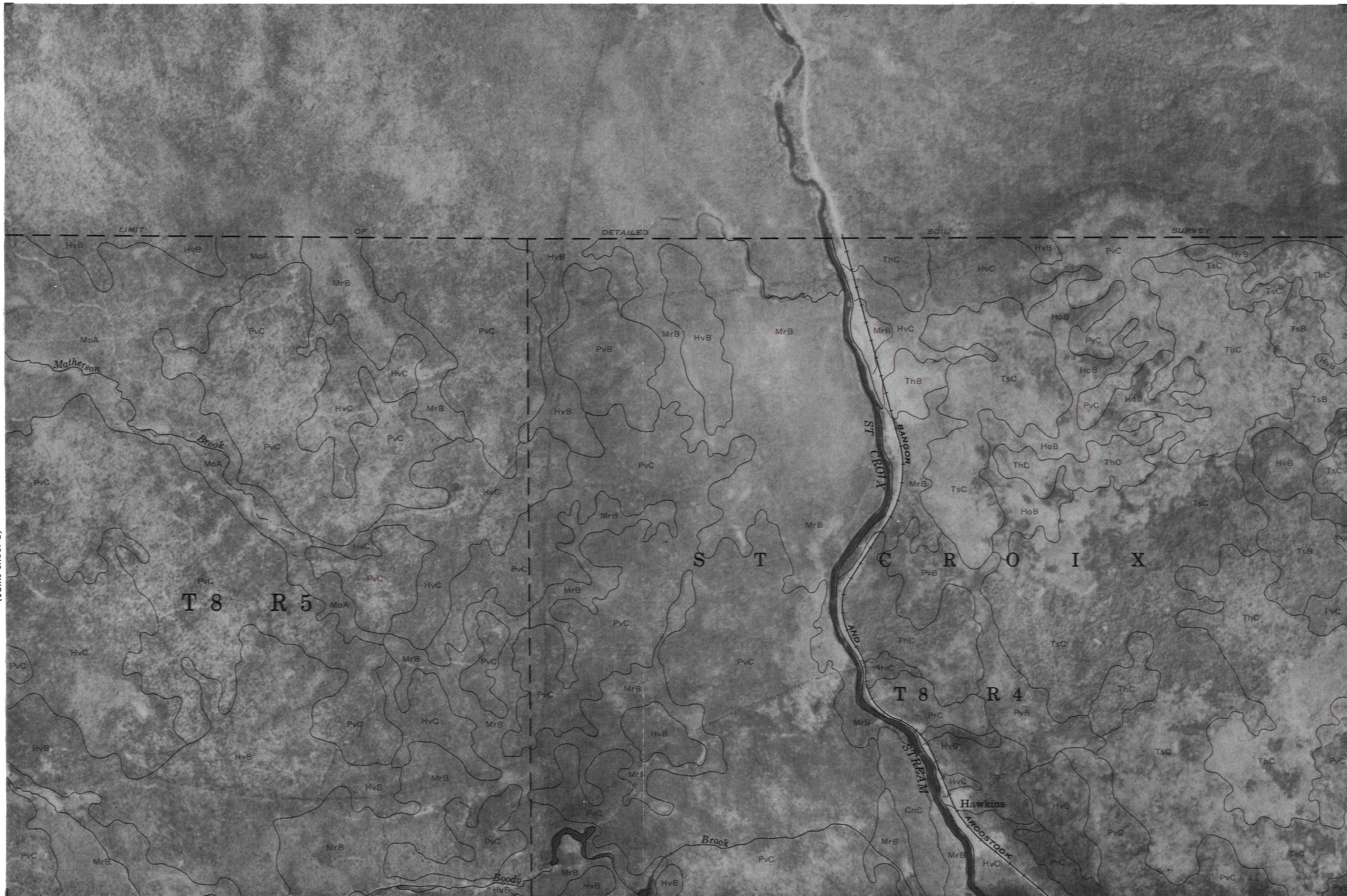

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0 5000 Feet

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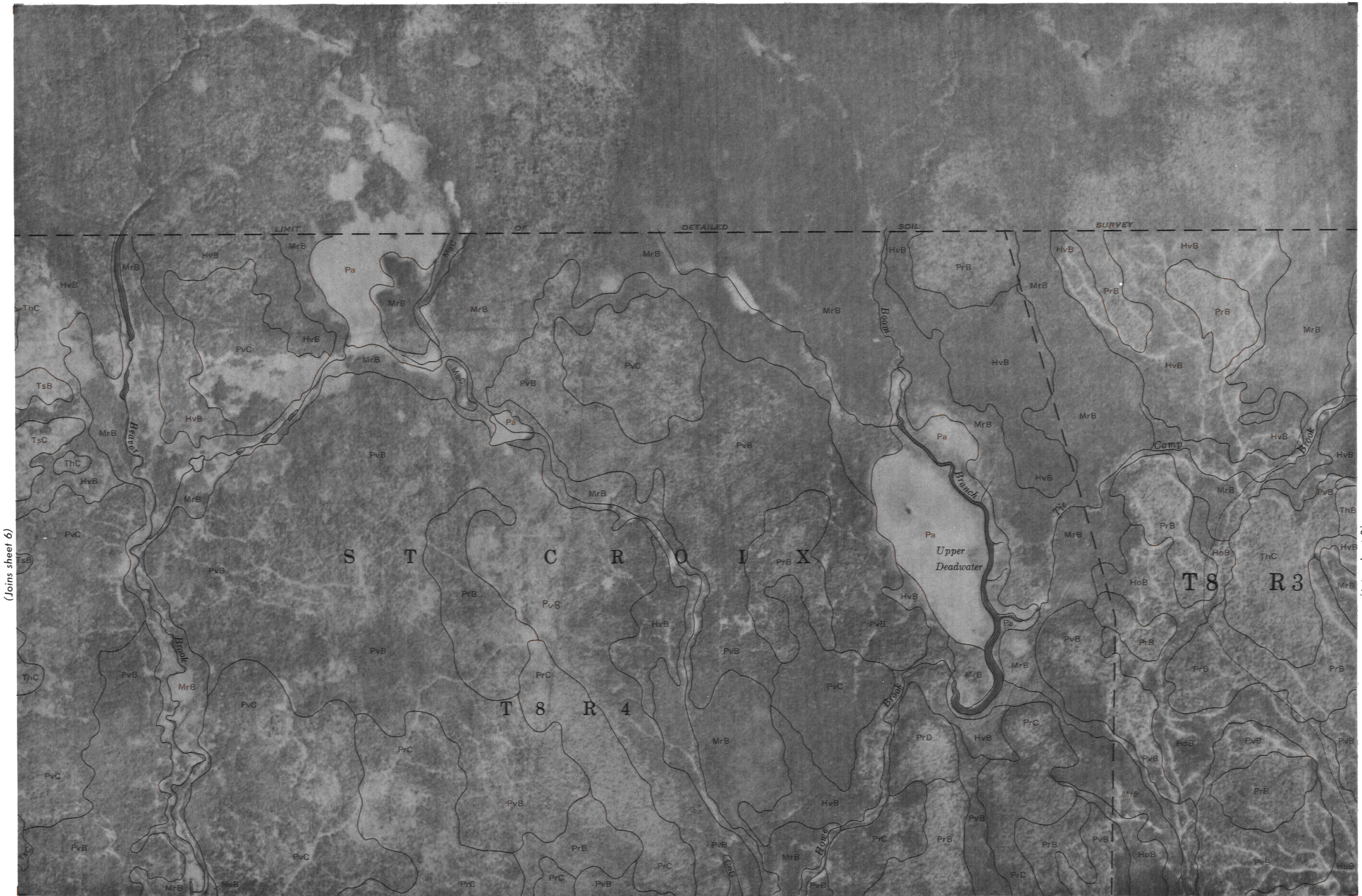

(Joins sheet 8)

(Joins sheet 14)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.


8
N
LIMIT OF DETAILED SOIL SURVEY
Nighthawk Mountain
T 8 R 3
Tie Camp Bk.
South Branch
Brook
Meduxnekeag River
Hovey
East Branch
(Joins sheet 7)
(Joins sheet 9)
(Joins sheet 15)
MrB
Scale 1:20000
0 ½ 1 Mile
0 5000 Feet

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(Joins sheet 8)

(Joins sheet 10)

0 ½ 1 Mile

Scale 1: 20000

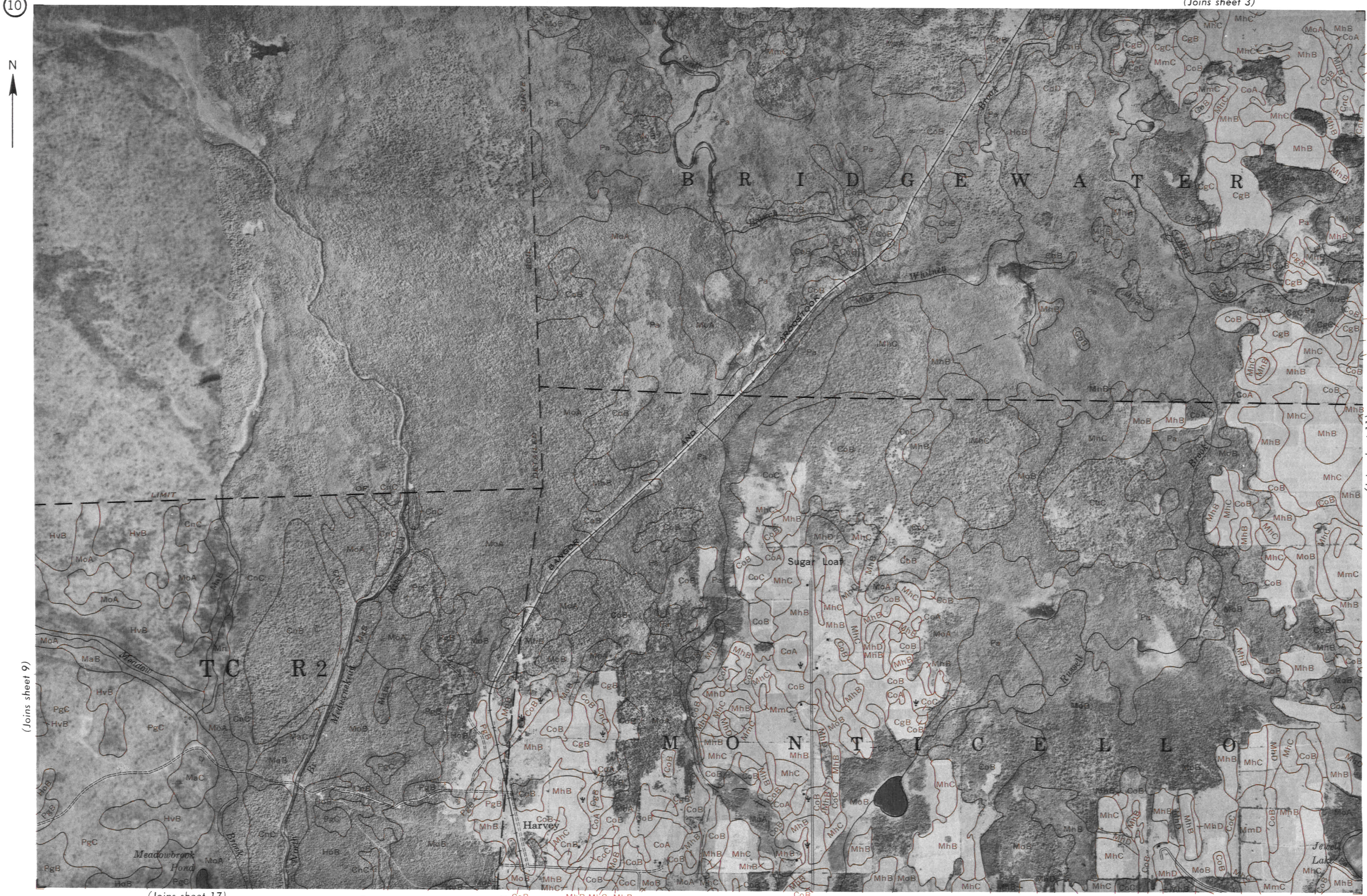
0 5000 Feet

(Joins sheet 16)

(Joins sheet 3)

(Joins sheet 9)

(Joins sheet 11)



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0 ½ 1 Mile

0 5000 Feet

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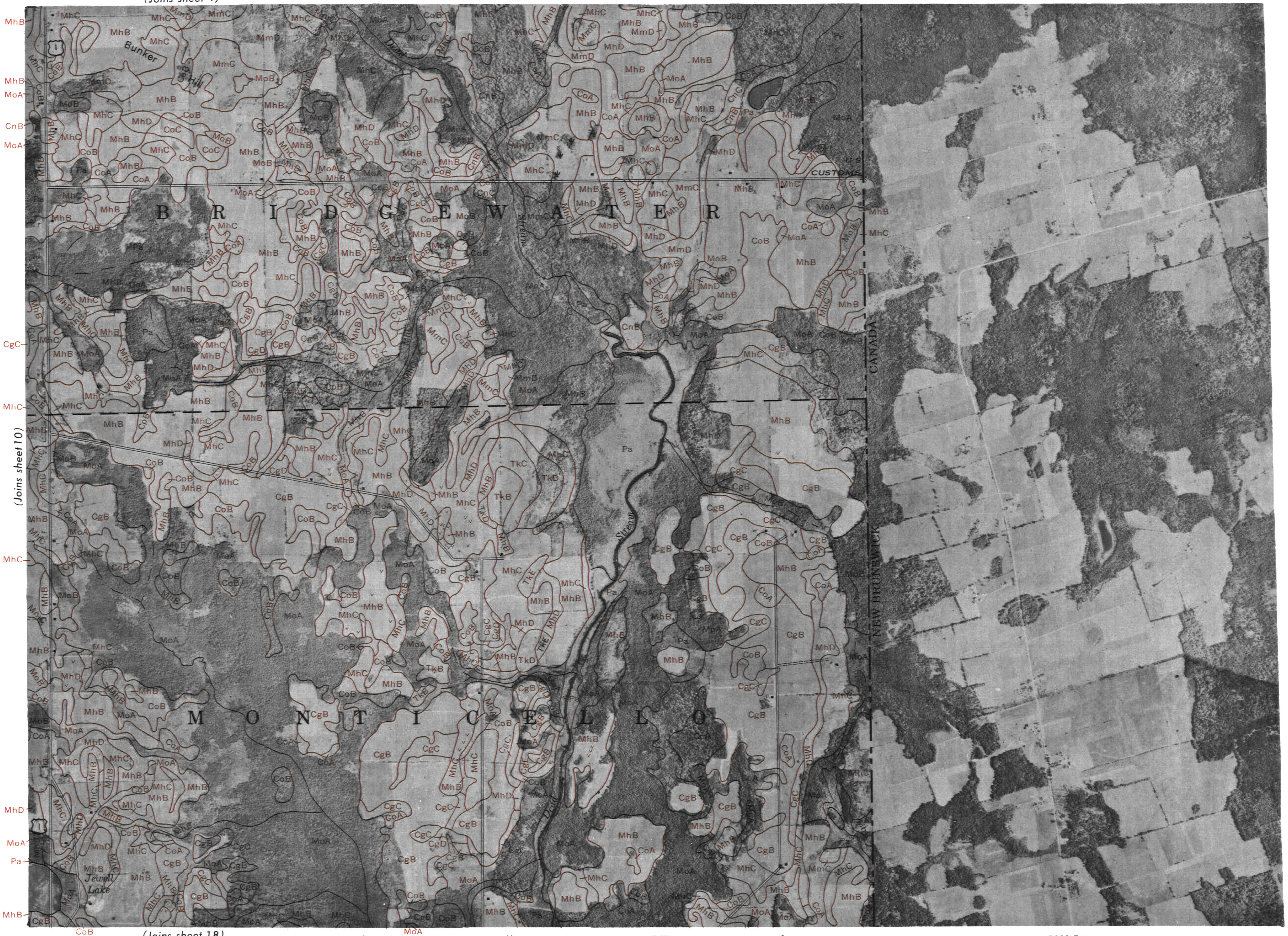

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0 ½ 1 Mile Scale 1:20000 0 5000 Feet

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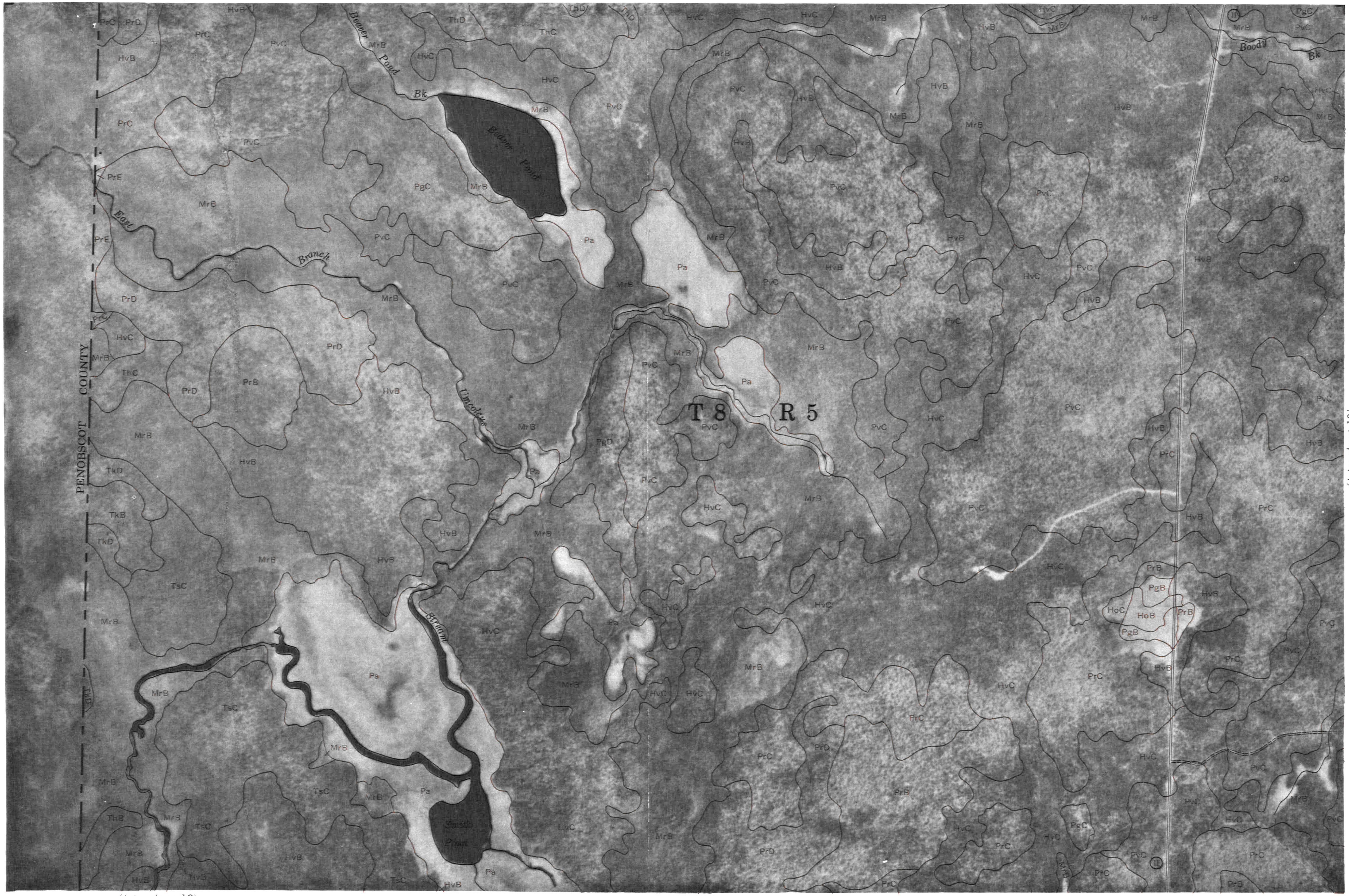
(Joins sheet 5)



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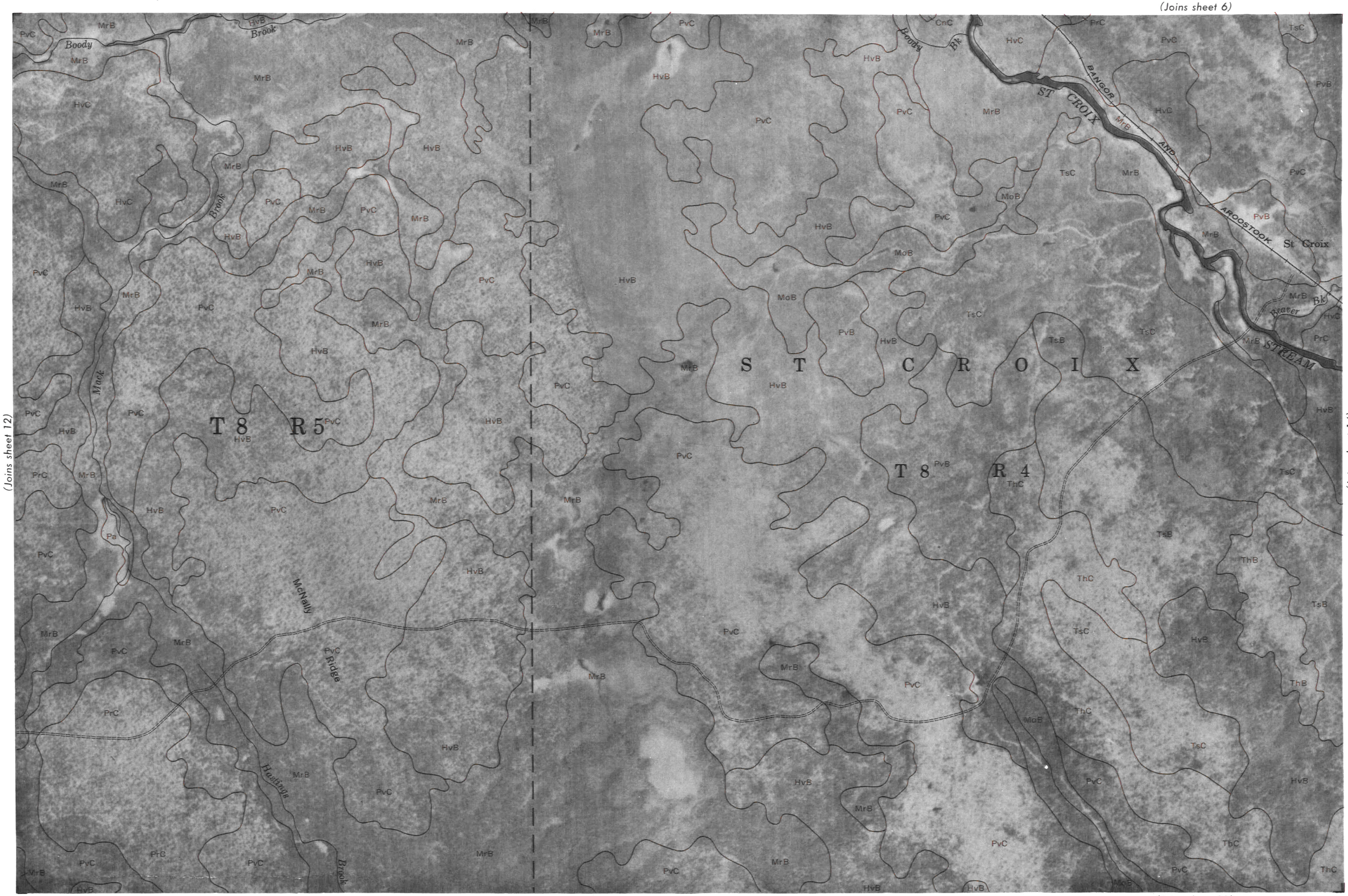

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Scale 1:20000

0 5000 Feet

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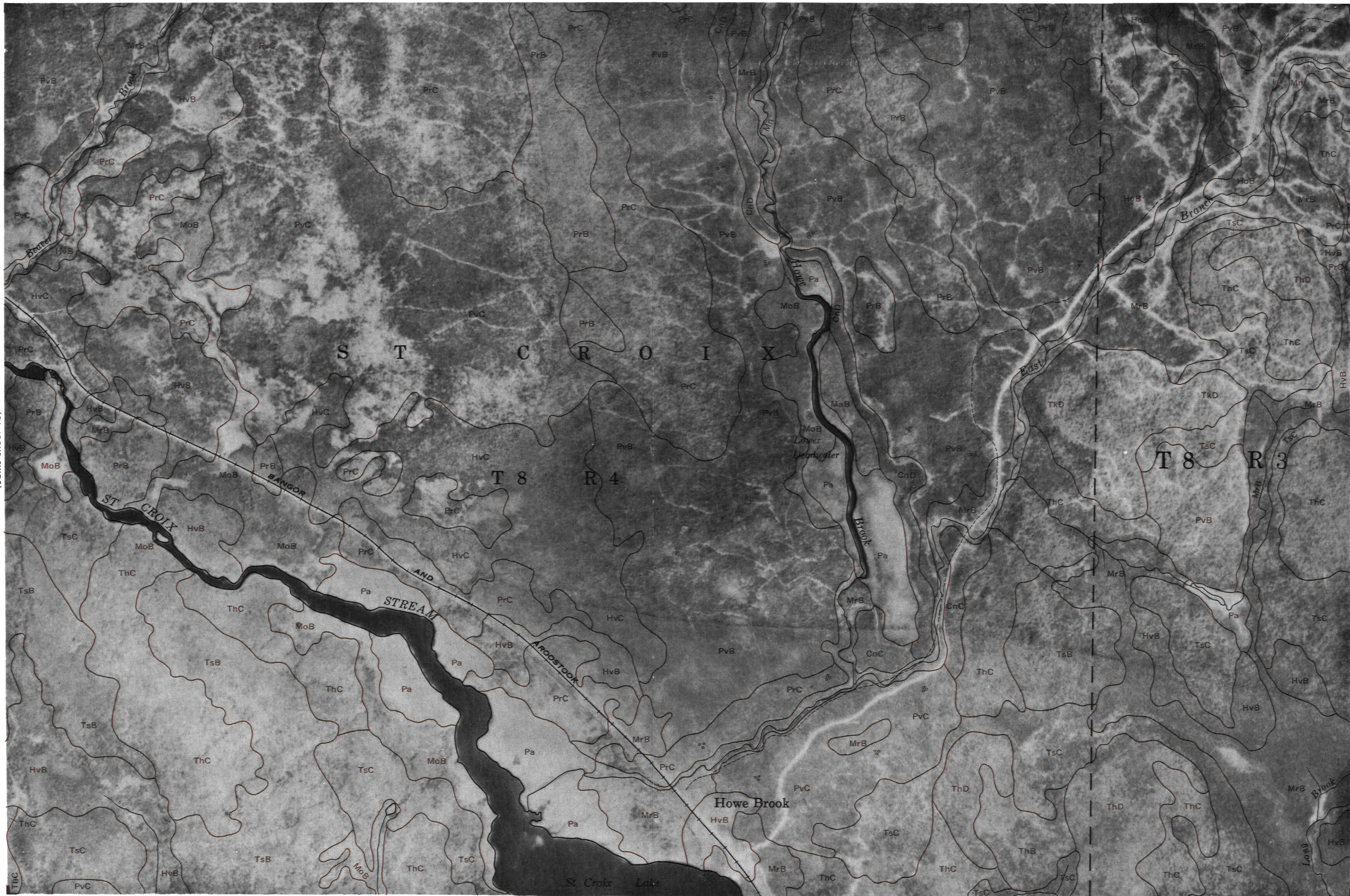

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0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 8)

15

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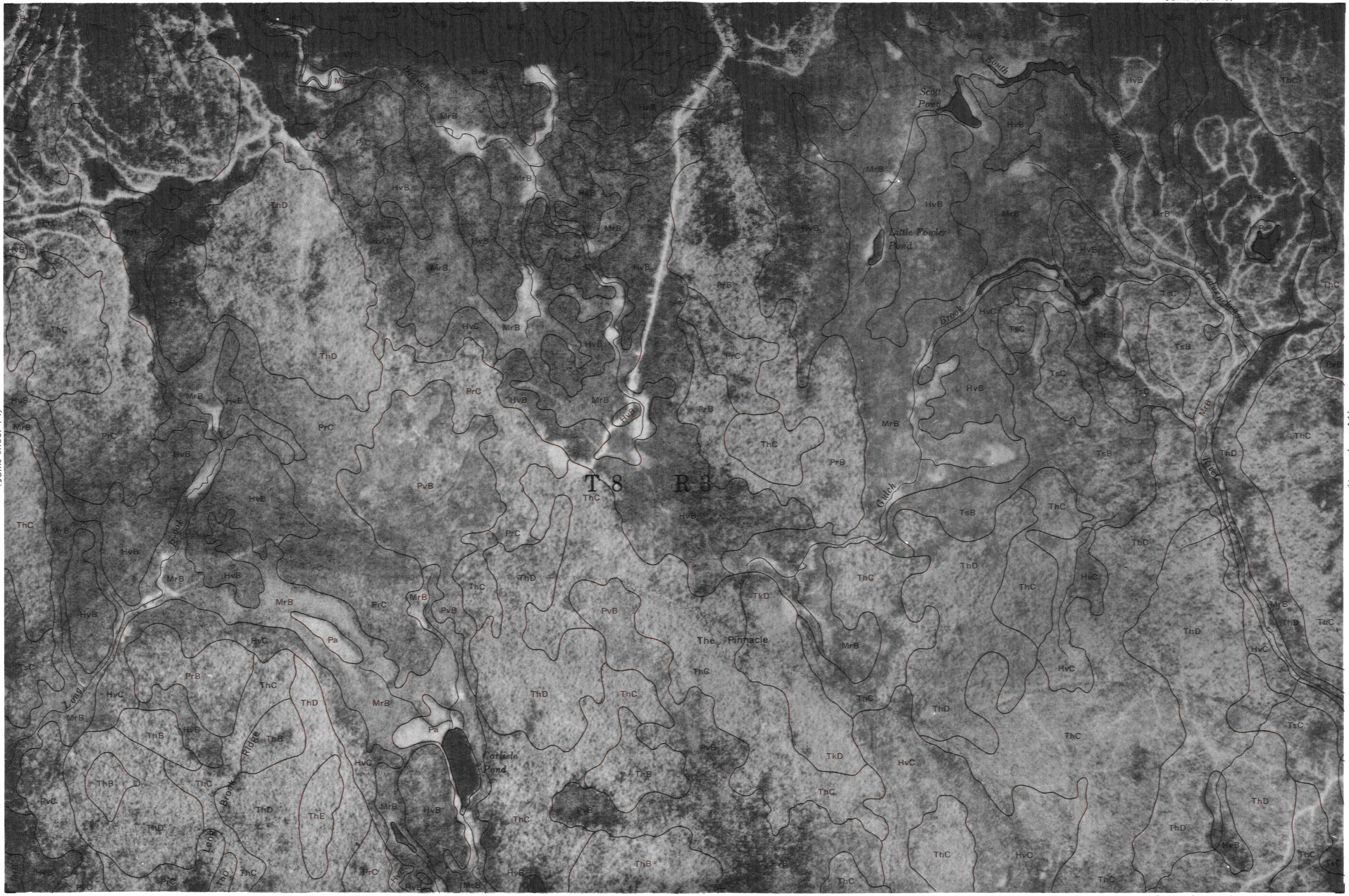

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(Joins sheet 22)

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16

(Joins sheet 9)

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(Joins sheet 15)

(Joins sheet 17)

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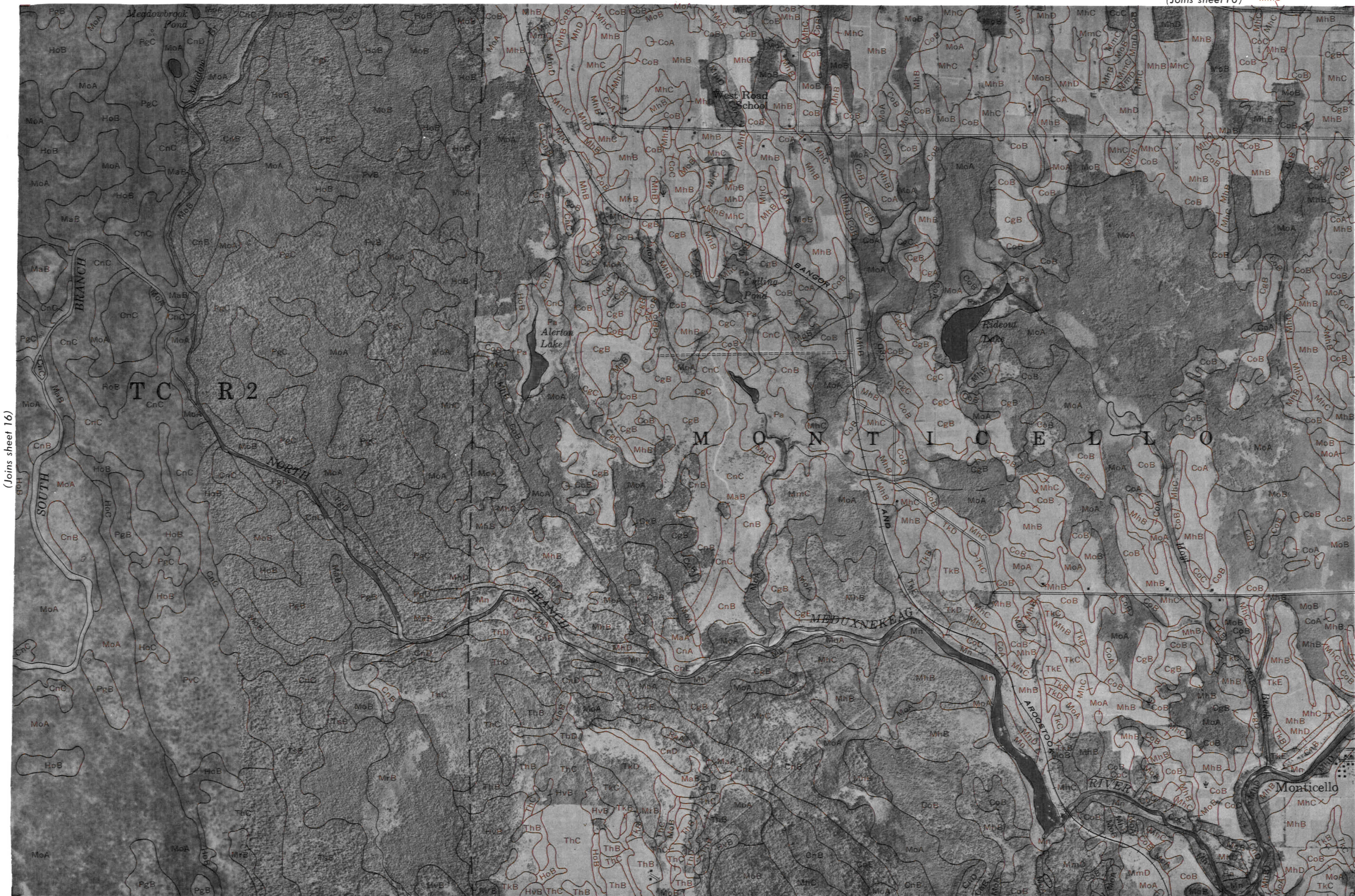

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0 ½ 1 Mile Scale 1: 20000 0 5000 Feet

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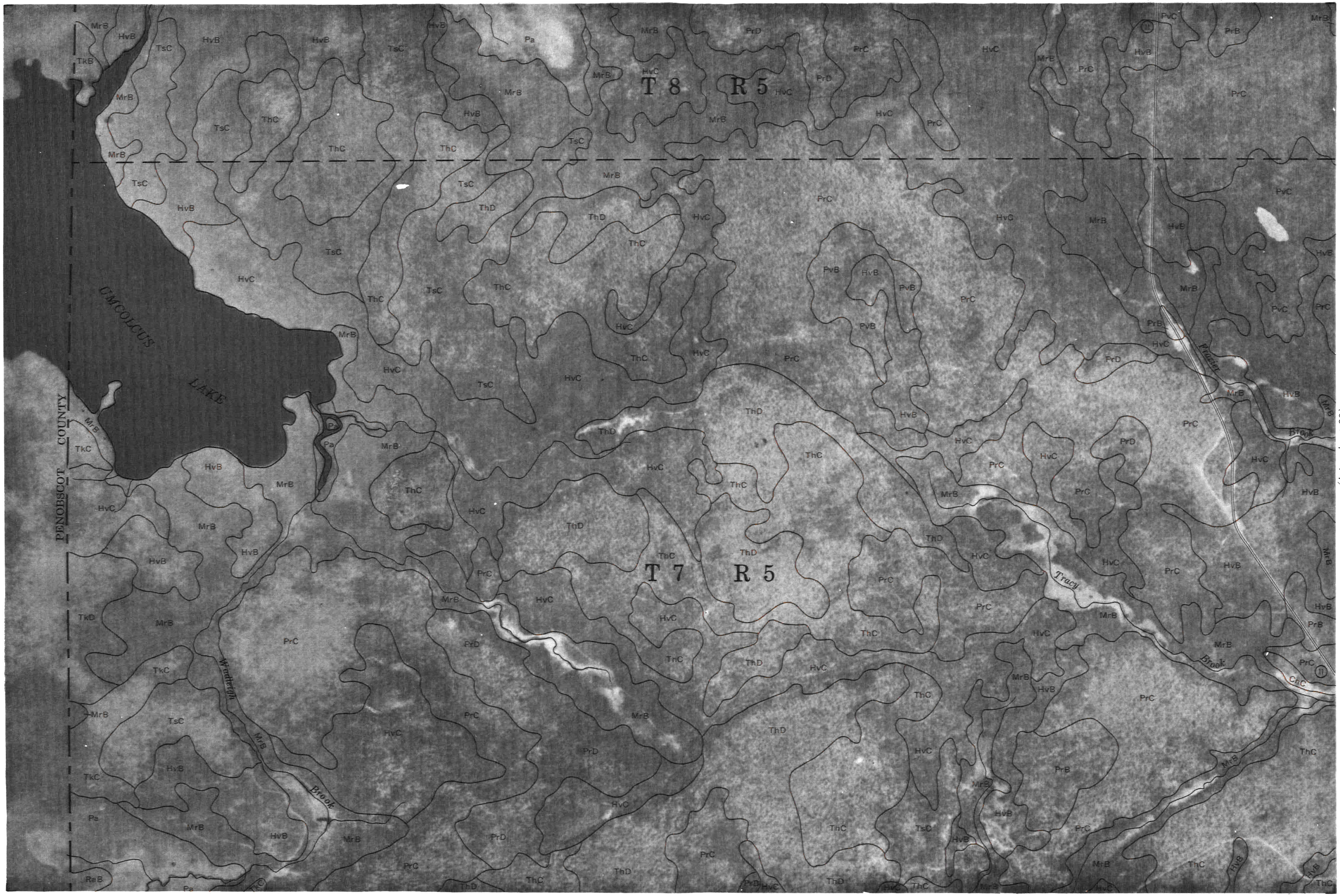
19



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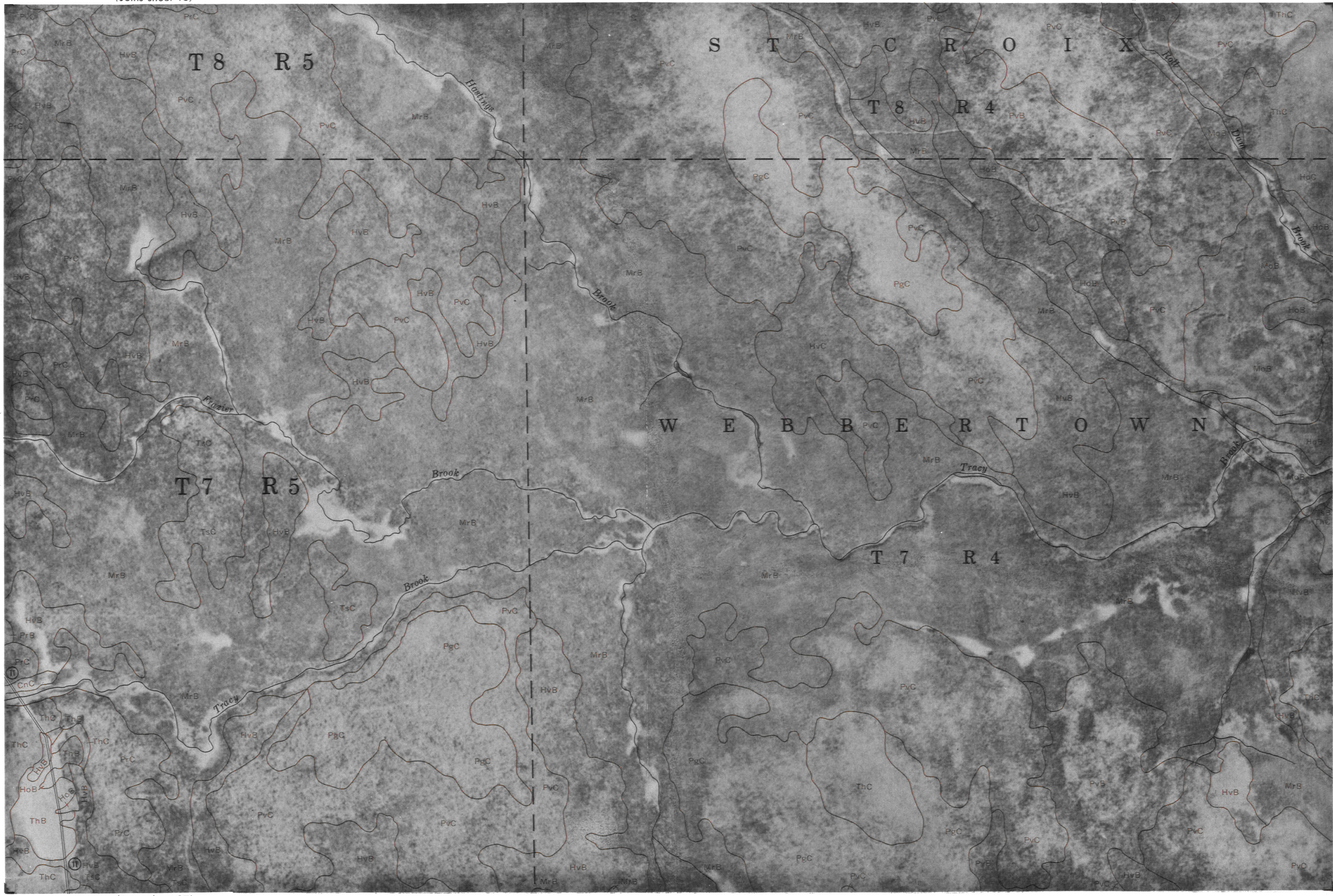

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0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 14)

21

(Joins sheet 20)

(Joins sheet 22)

(Joins sheet 28)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

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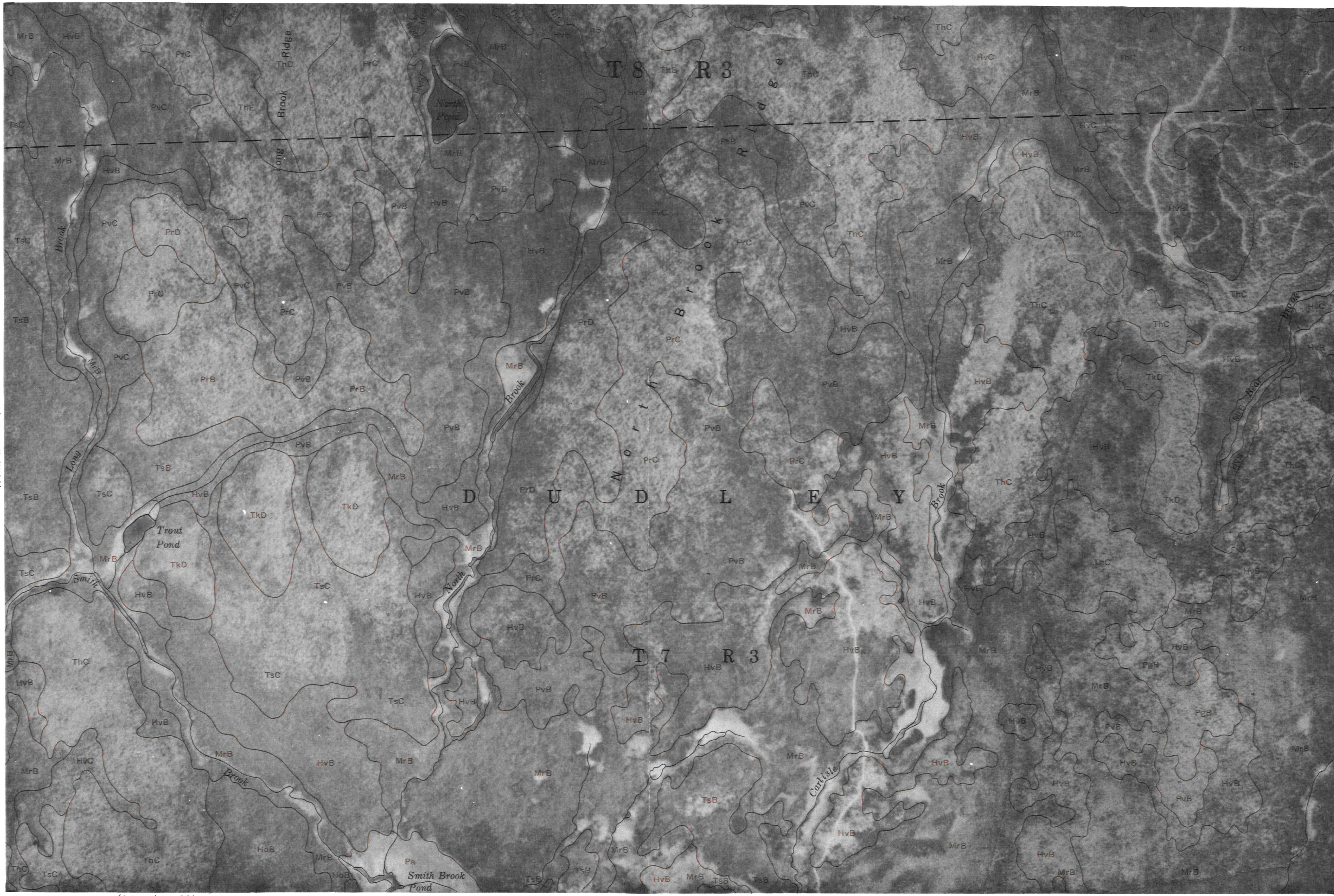

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(Joins sheet 29)

0 ½ 1 Mile

Scale 1:20000

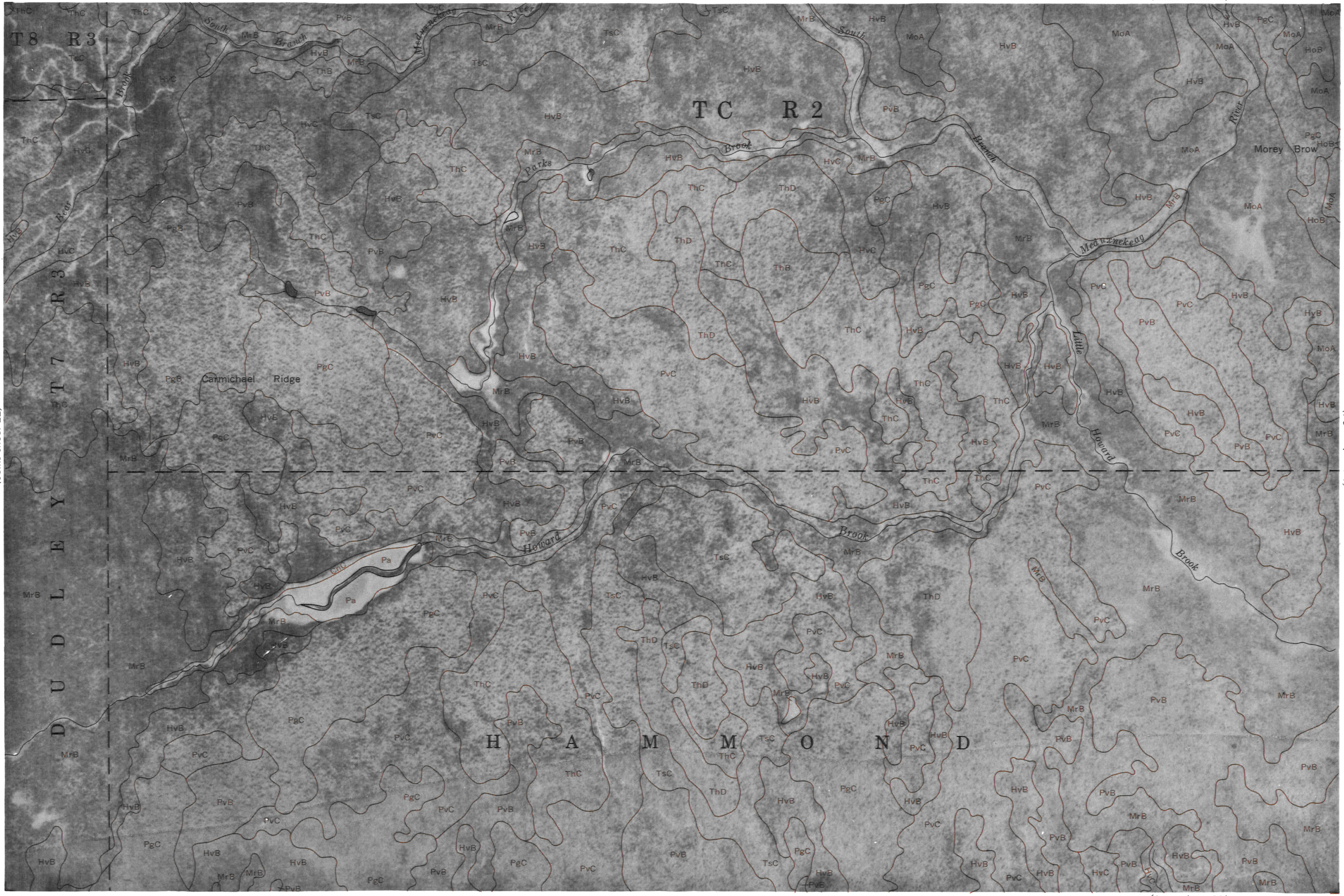
0 5000 Feet

(Joins sheet 16)

23

N

(Joins sheet 22)



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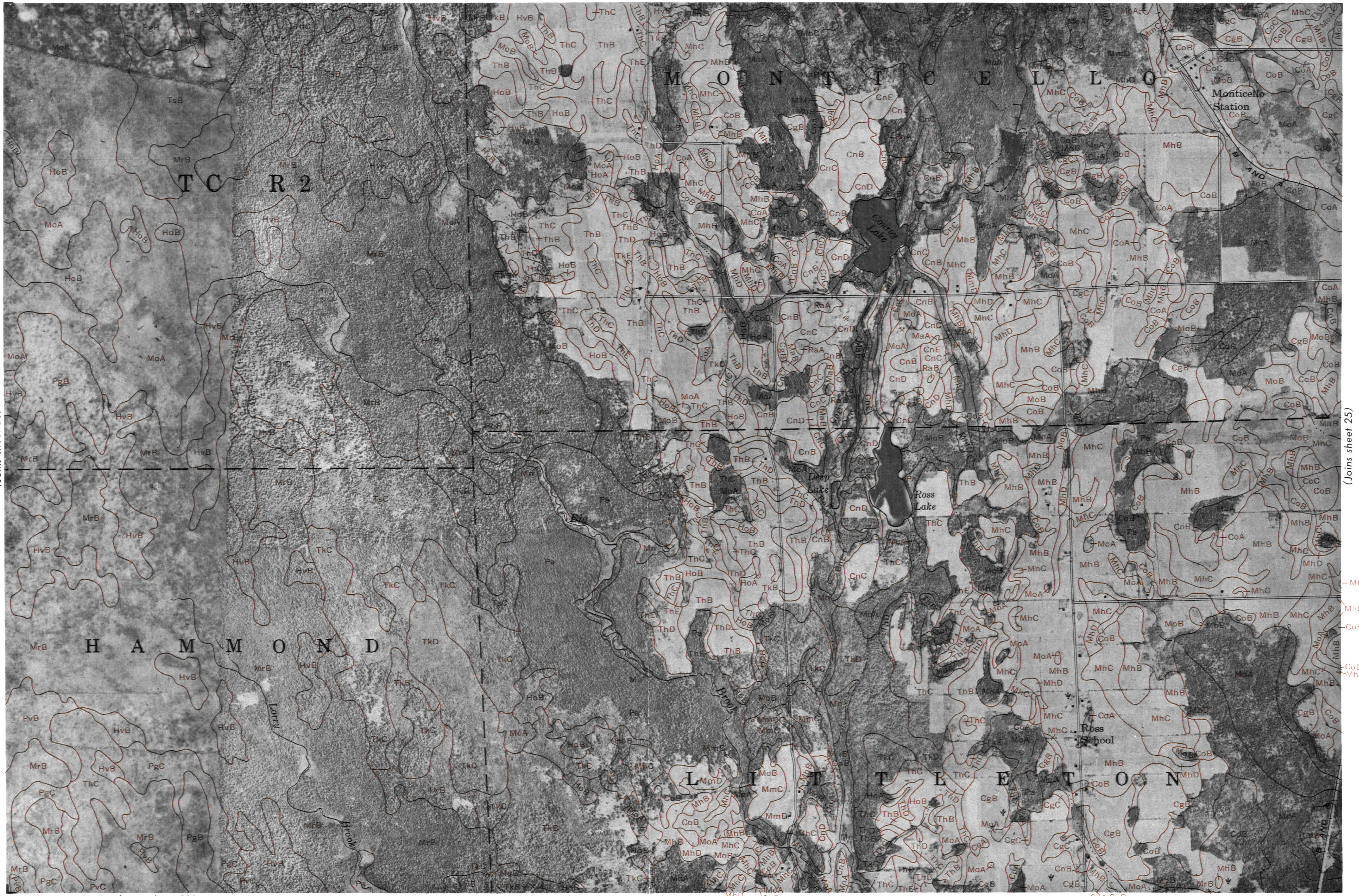

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0 ½ 1 Mile

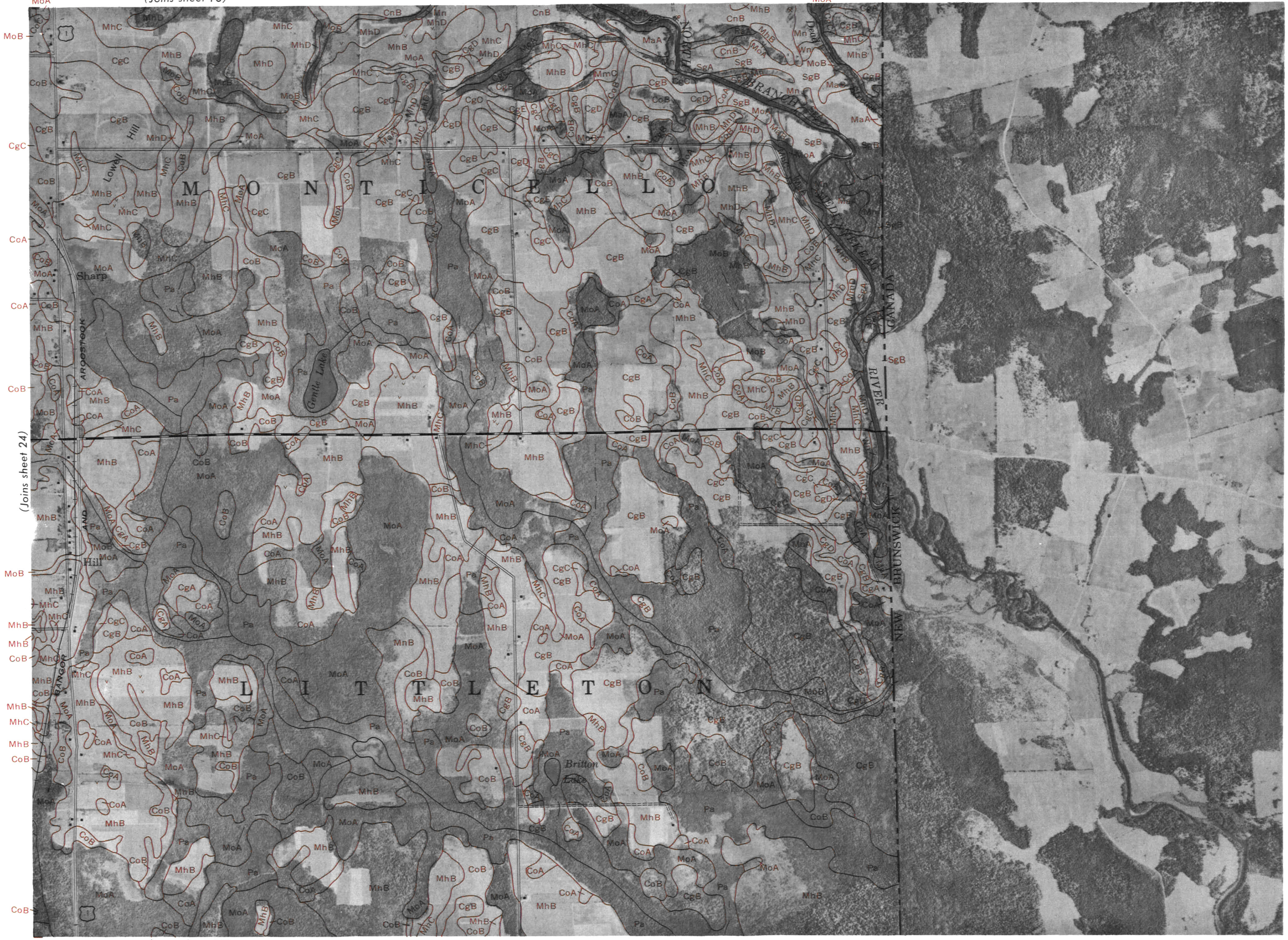
Scale 1:20000

0 5000 Feet

25

(Joins sheet 18)

(Joins sheet 24)



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Scale 1:20000

0 ½ 1 Mile

0 5000 Feet

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26

(Joins sheet 19)

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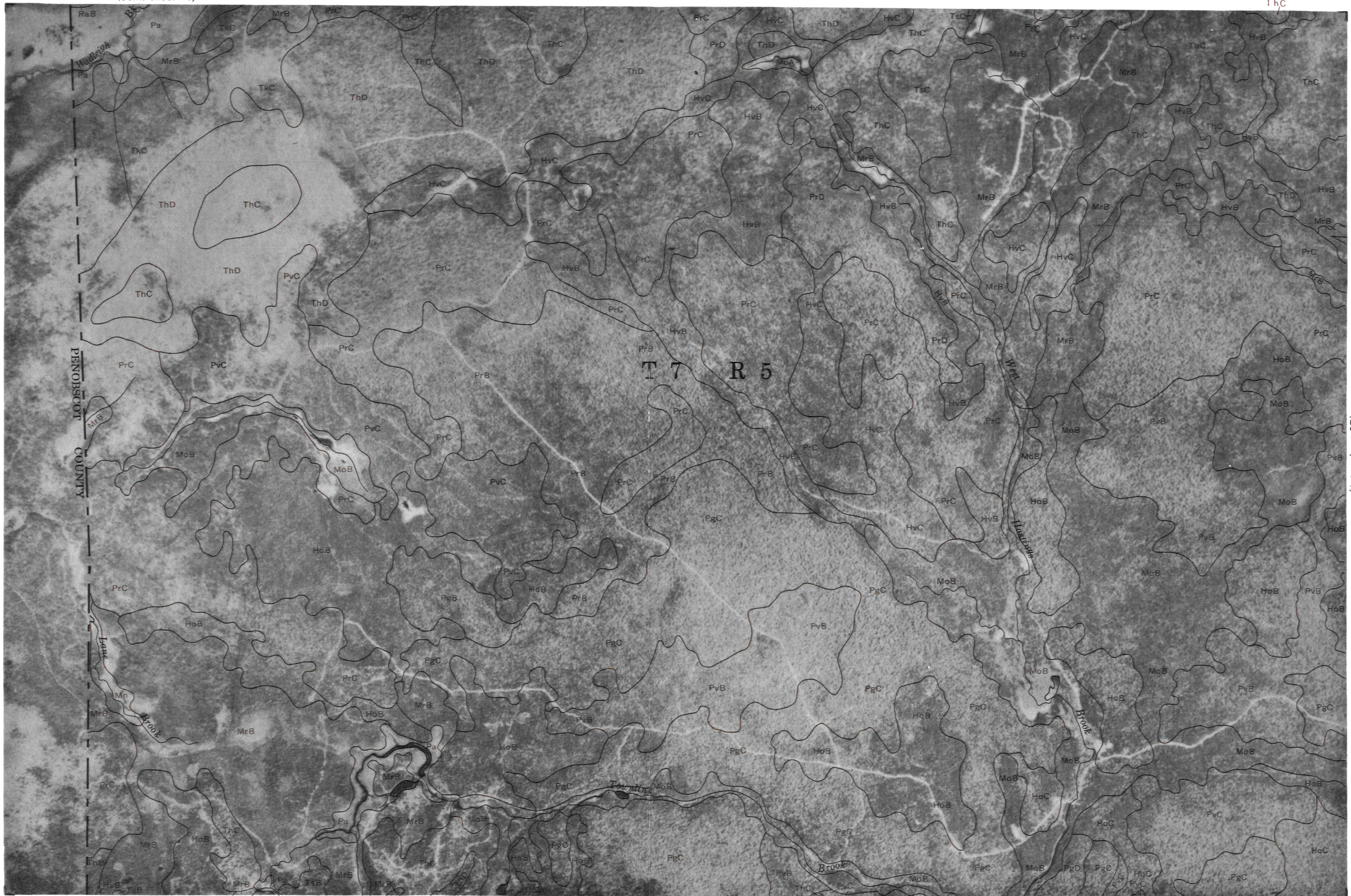

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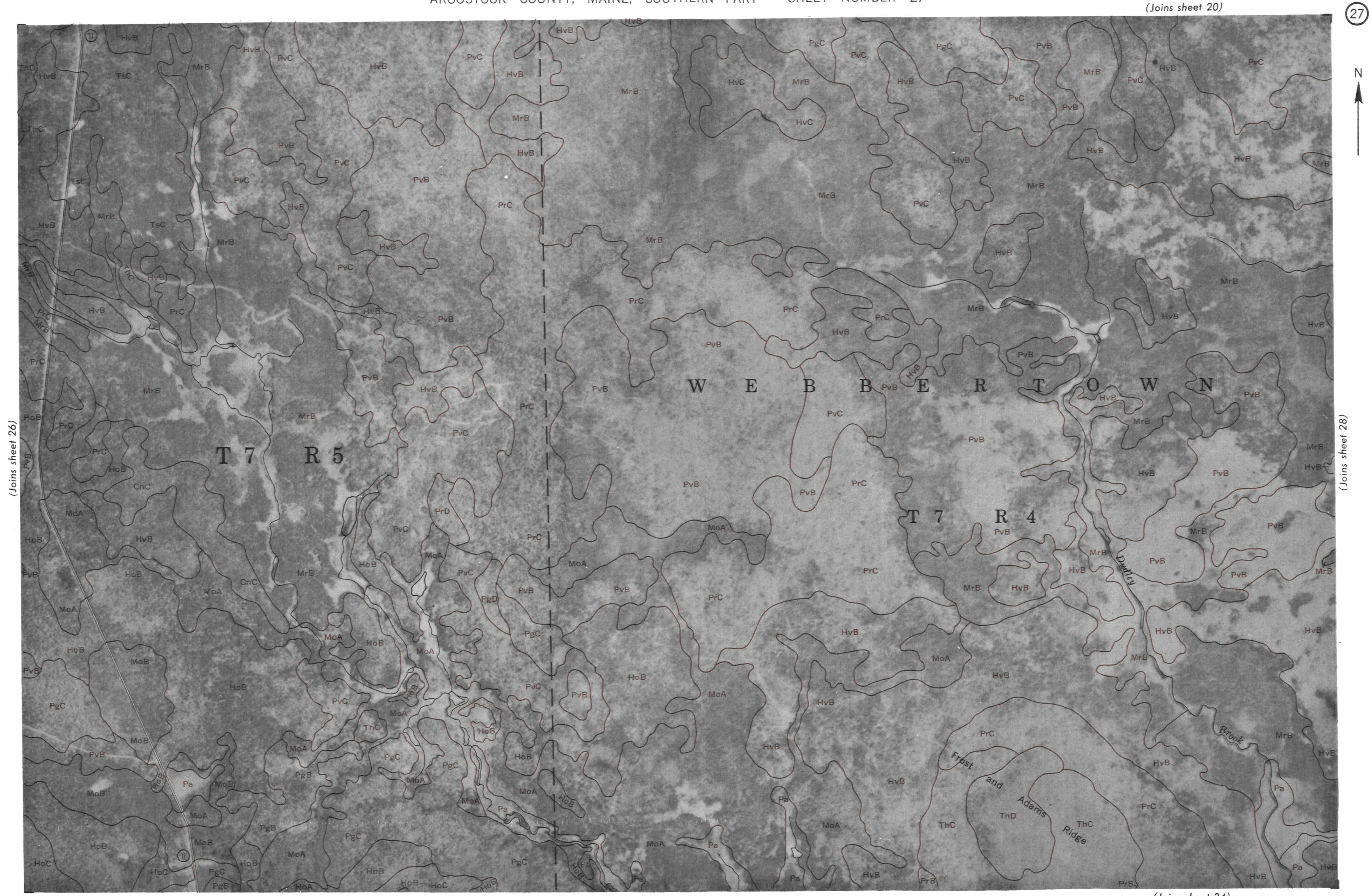
0 ½ 1 Mile

Scale 1:20000

0 5000 Feet



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(Joins sheet 21)

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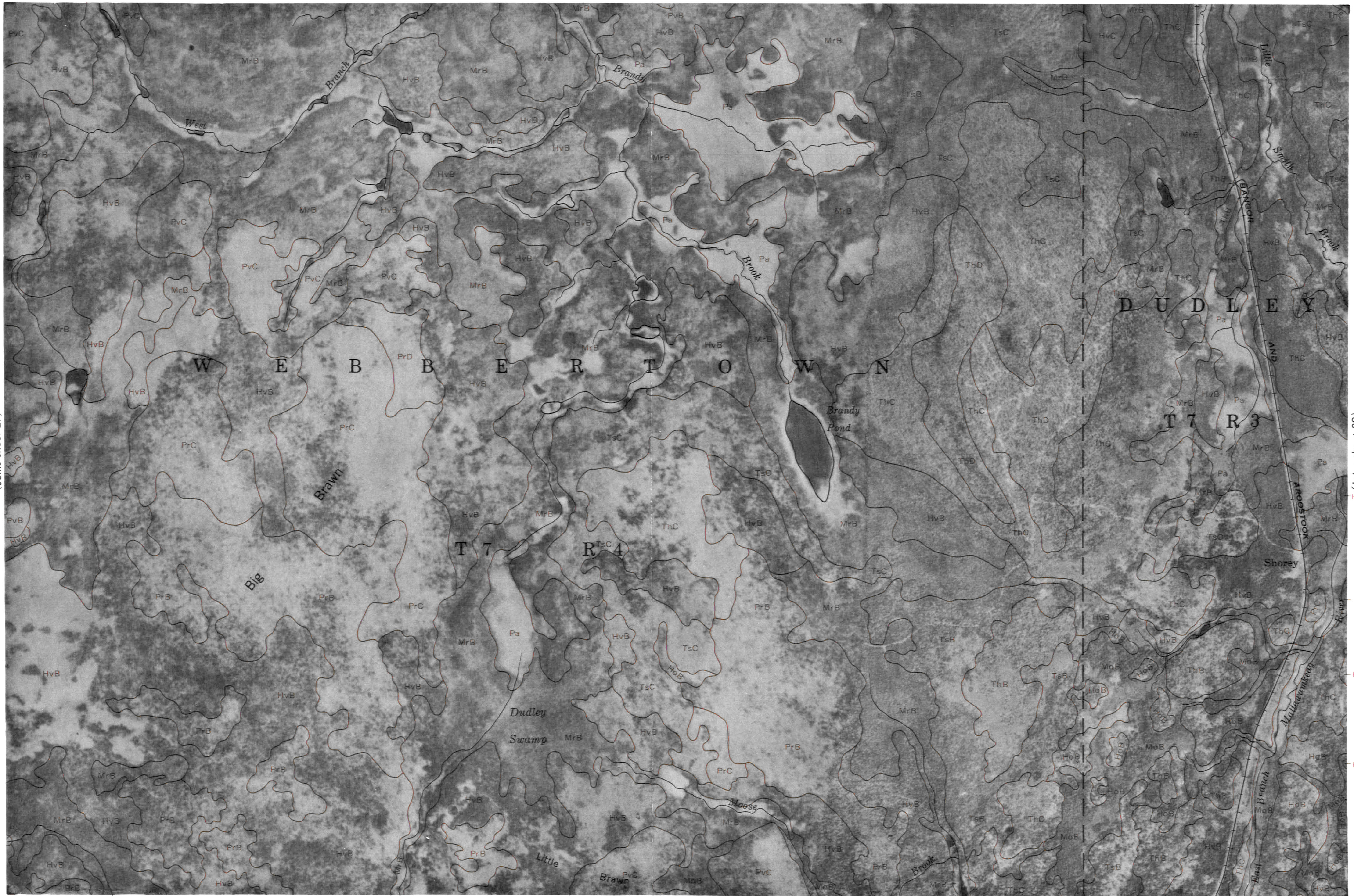

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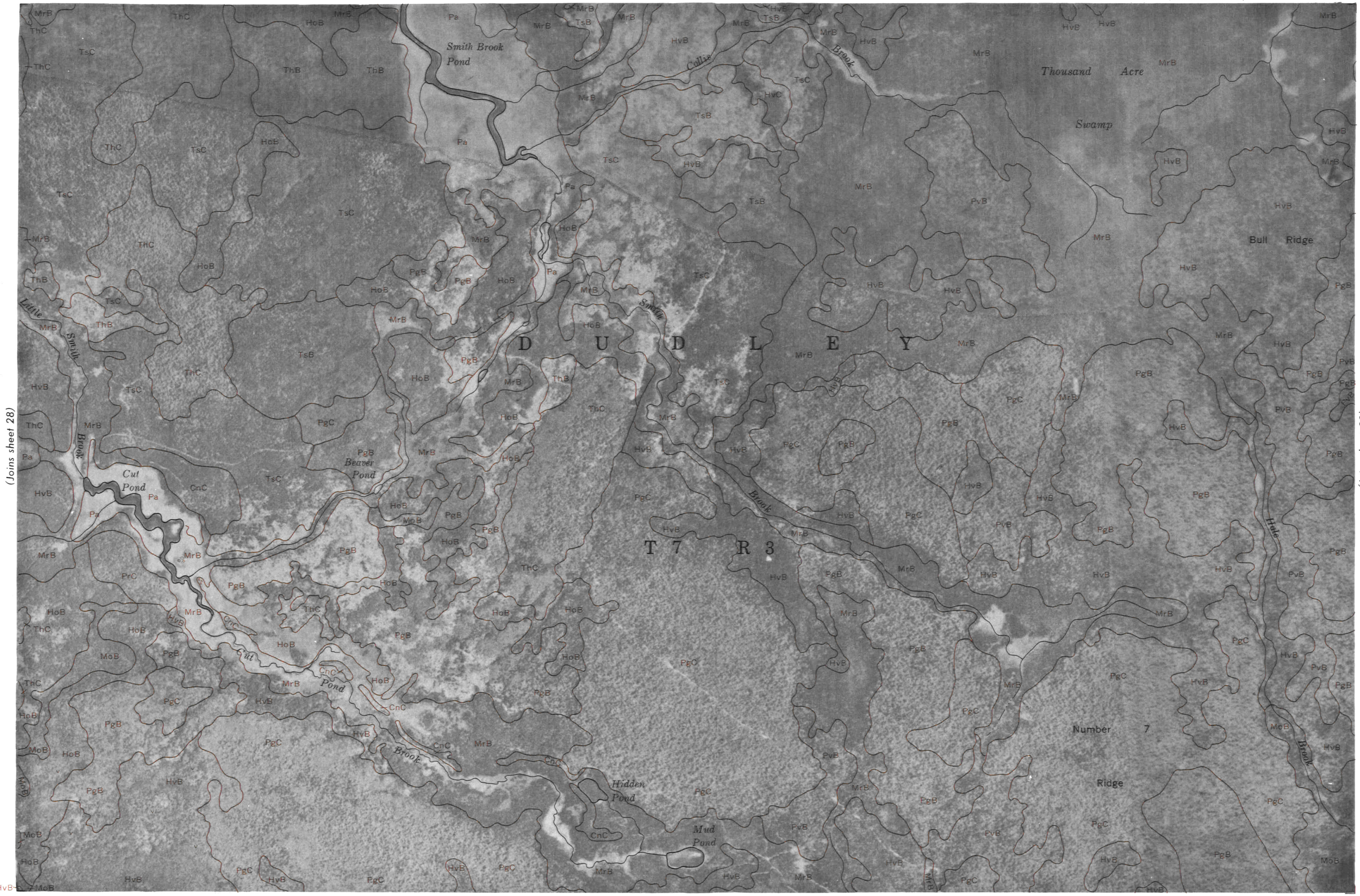

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0 ½ 1 Mile Scale 1:20000 0 5000 Feet

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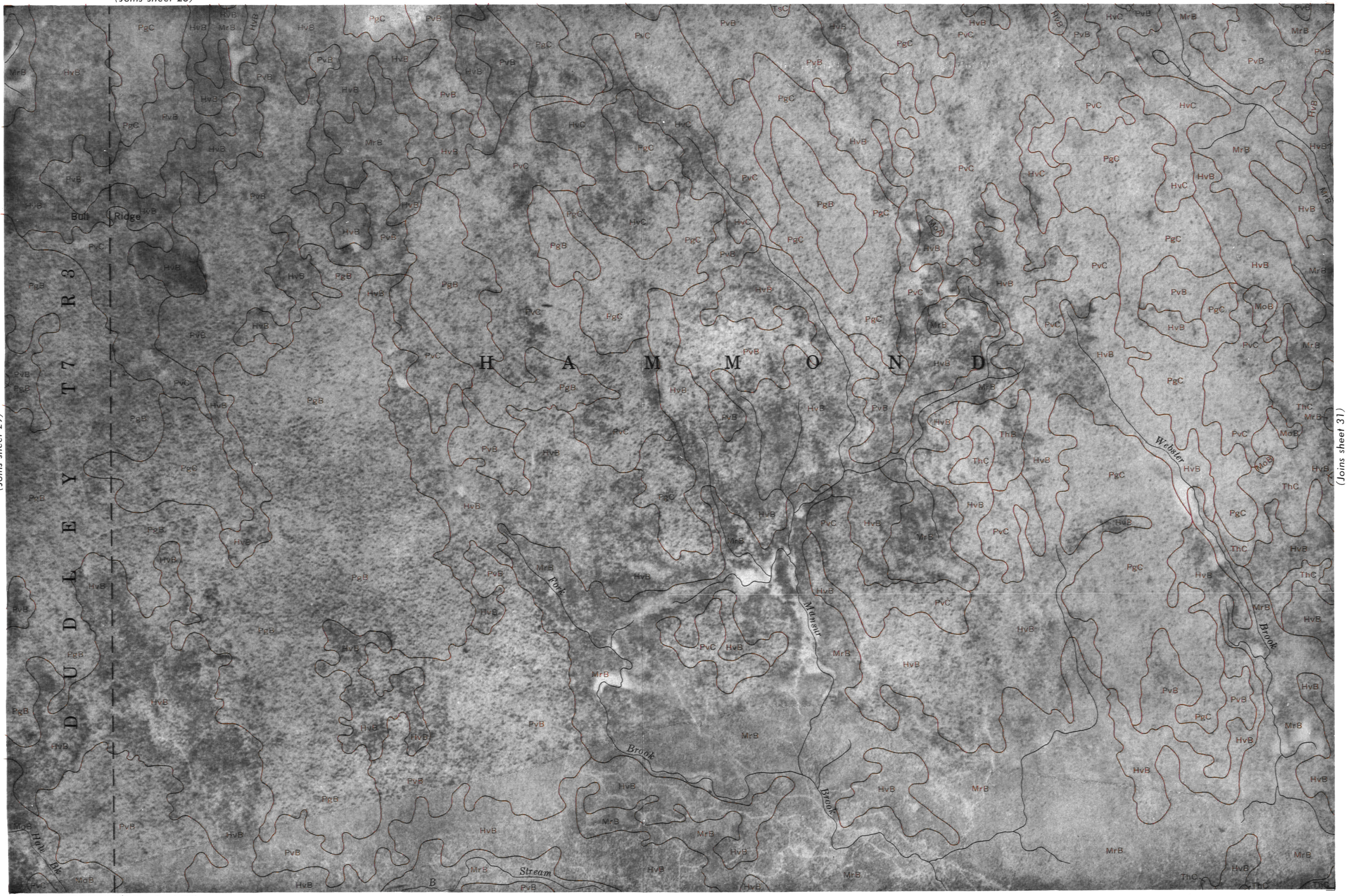

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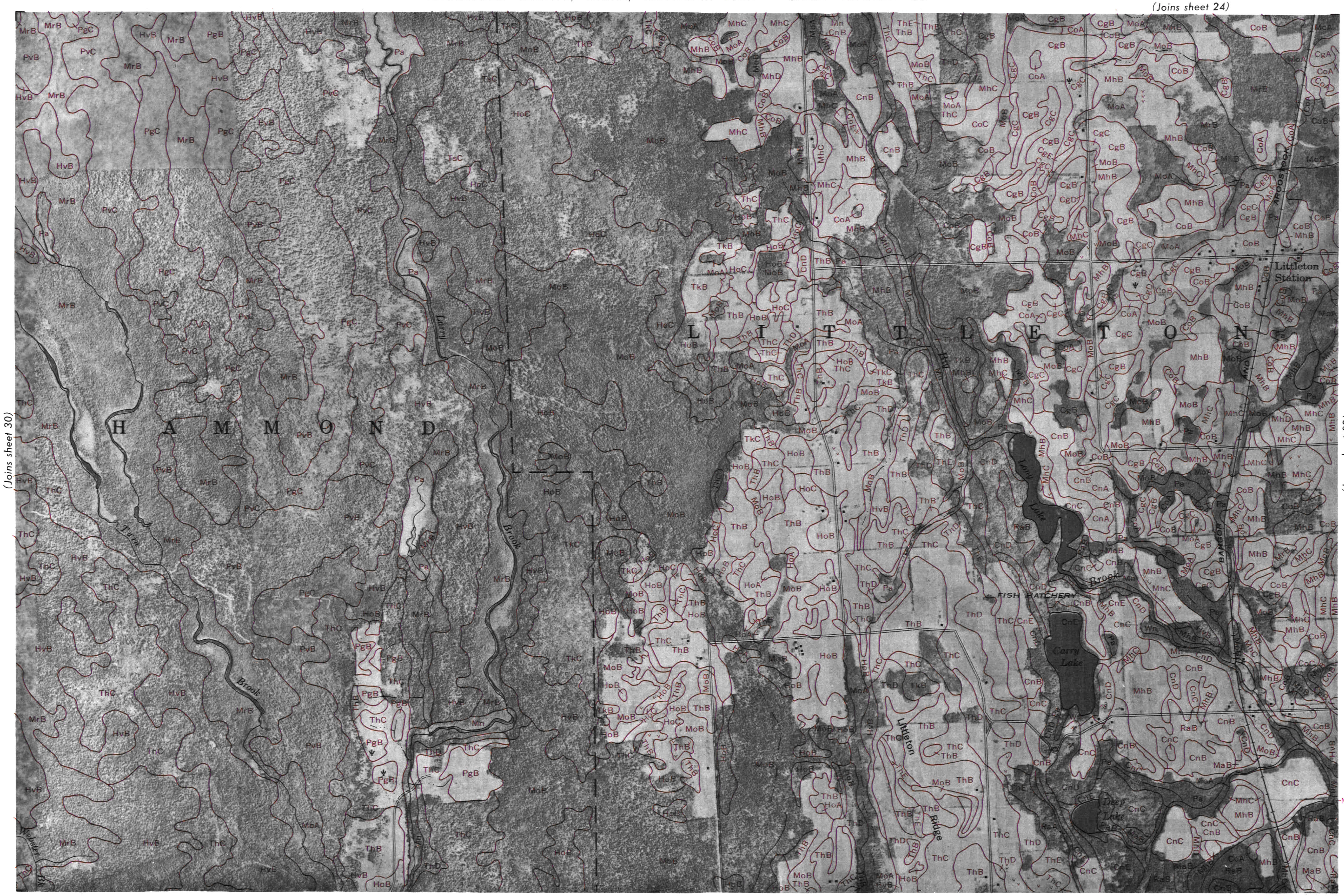

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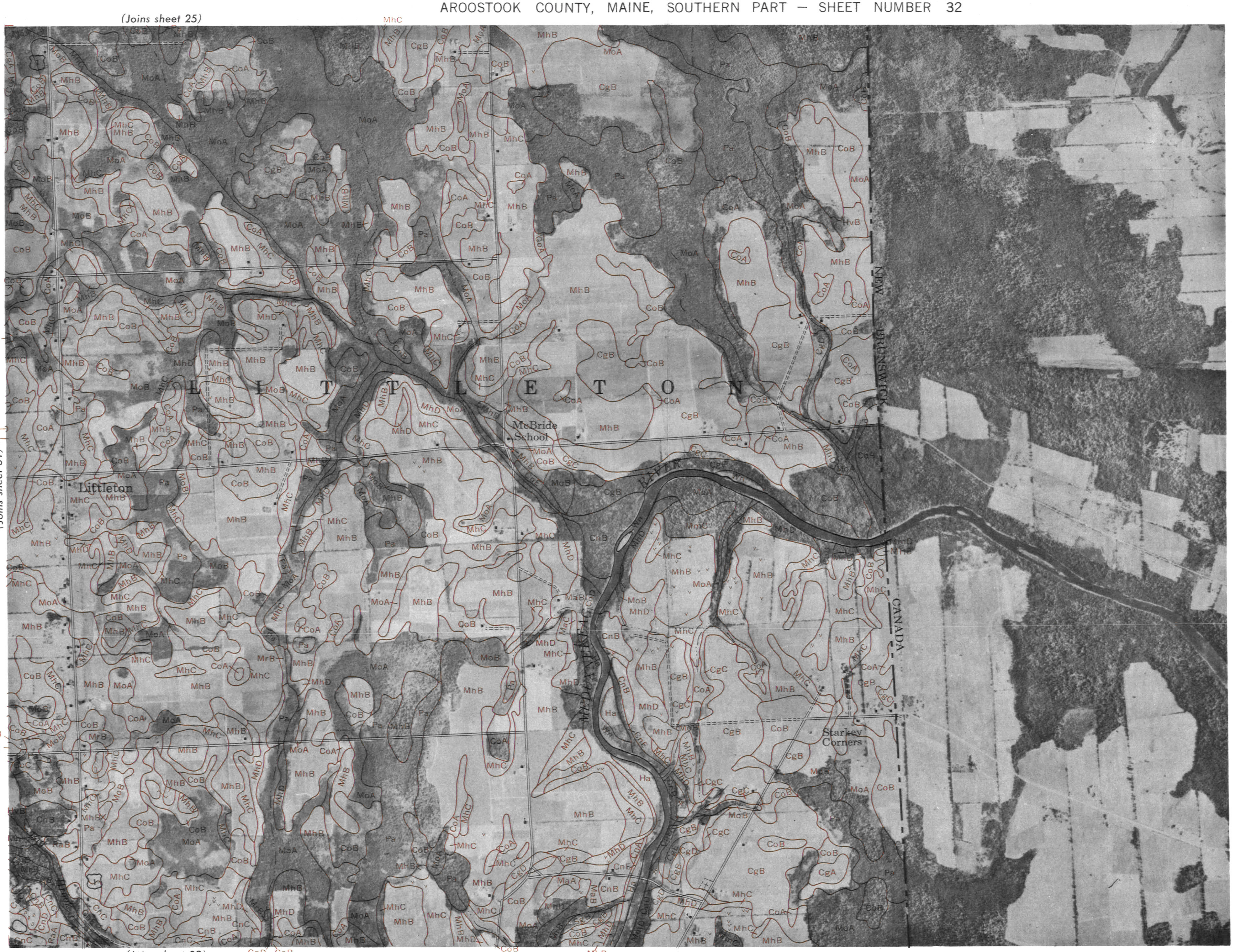
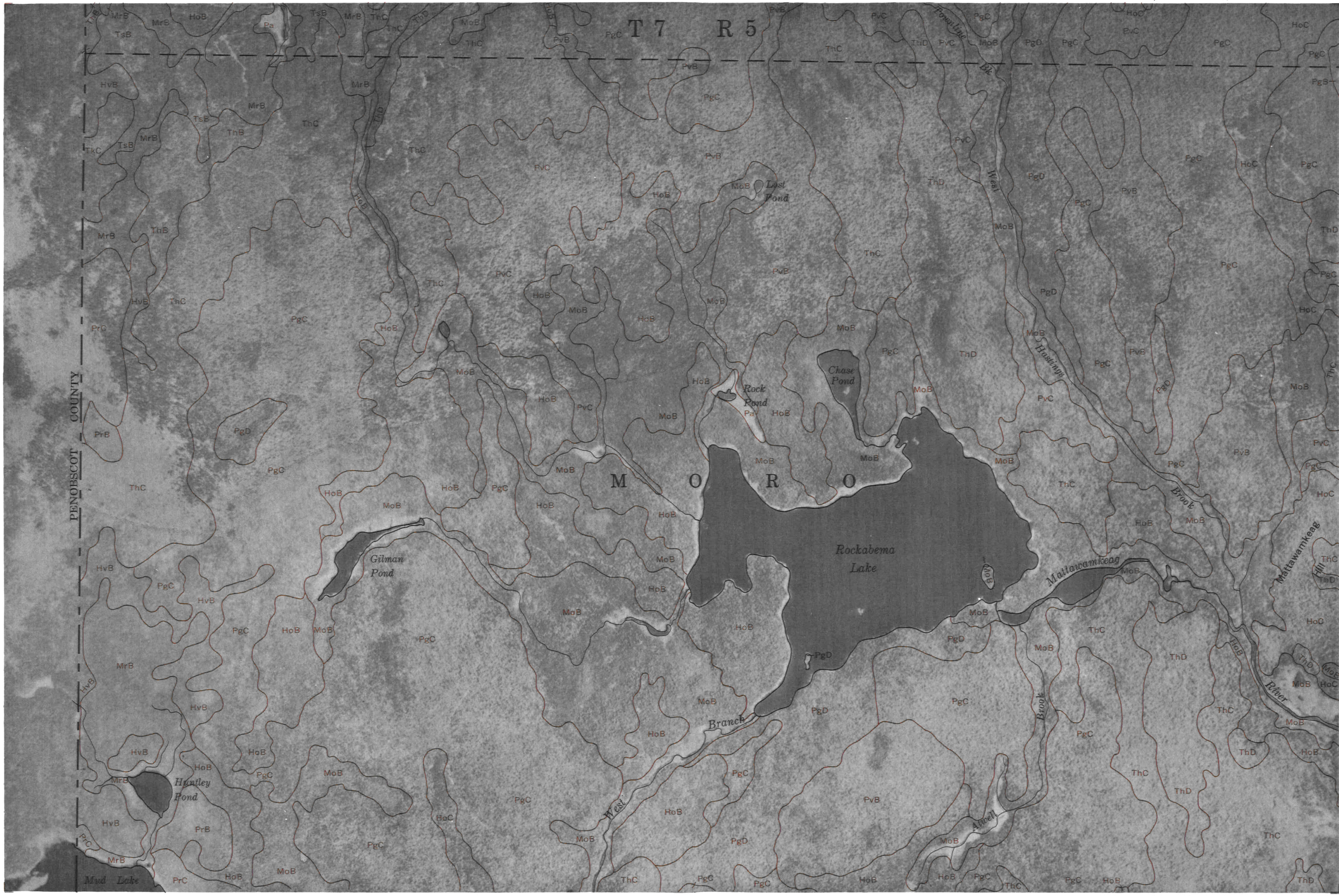
32



0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 26)

33



(Joins sheet 34)

(Joins sheet 40)

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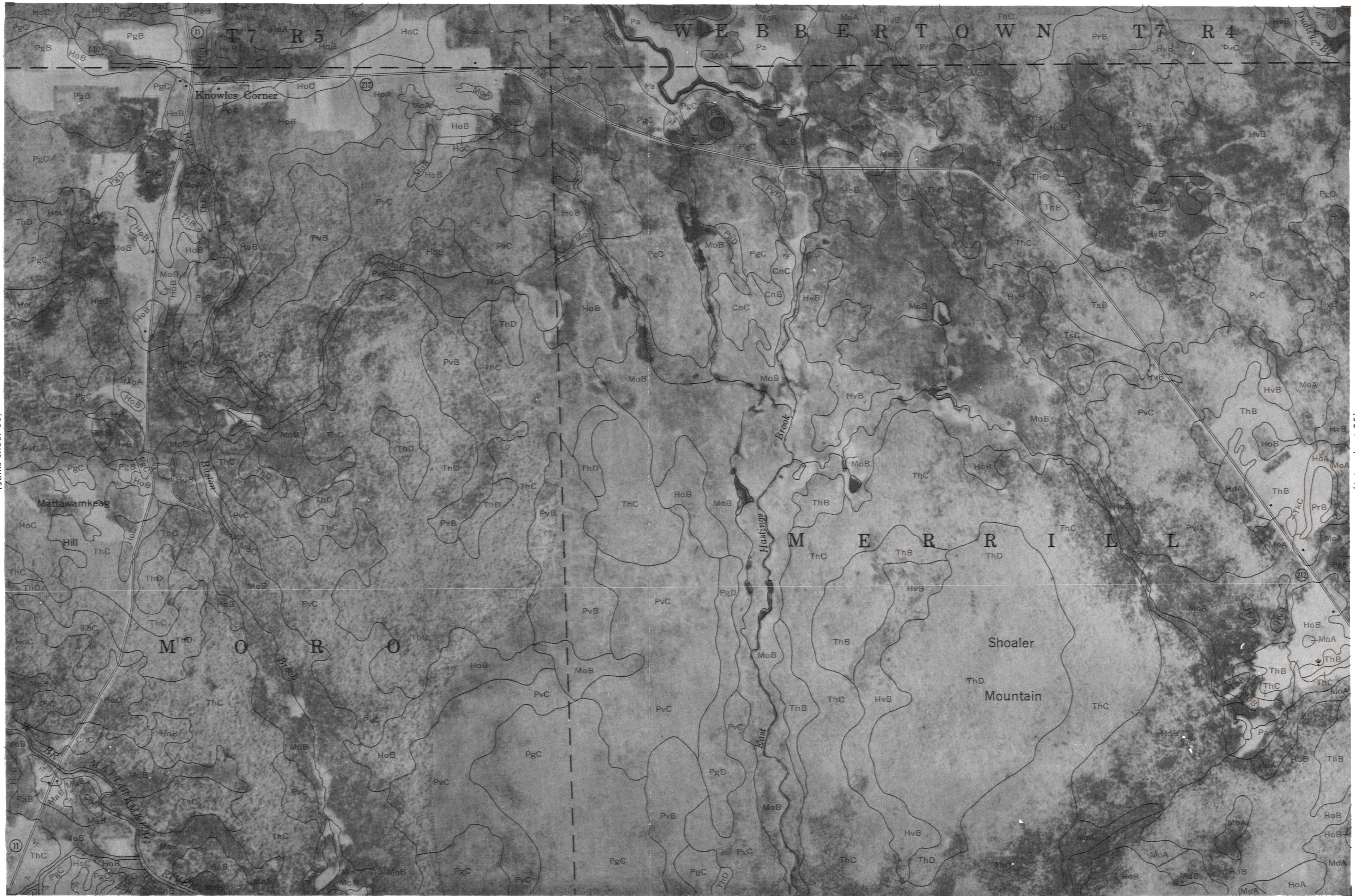
34

(Joins sheet 27)



(Joins sheet 33)

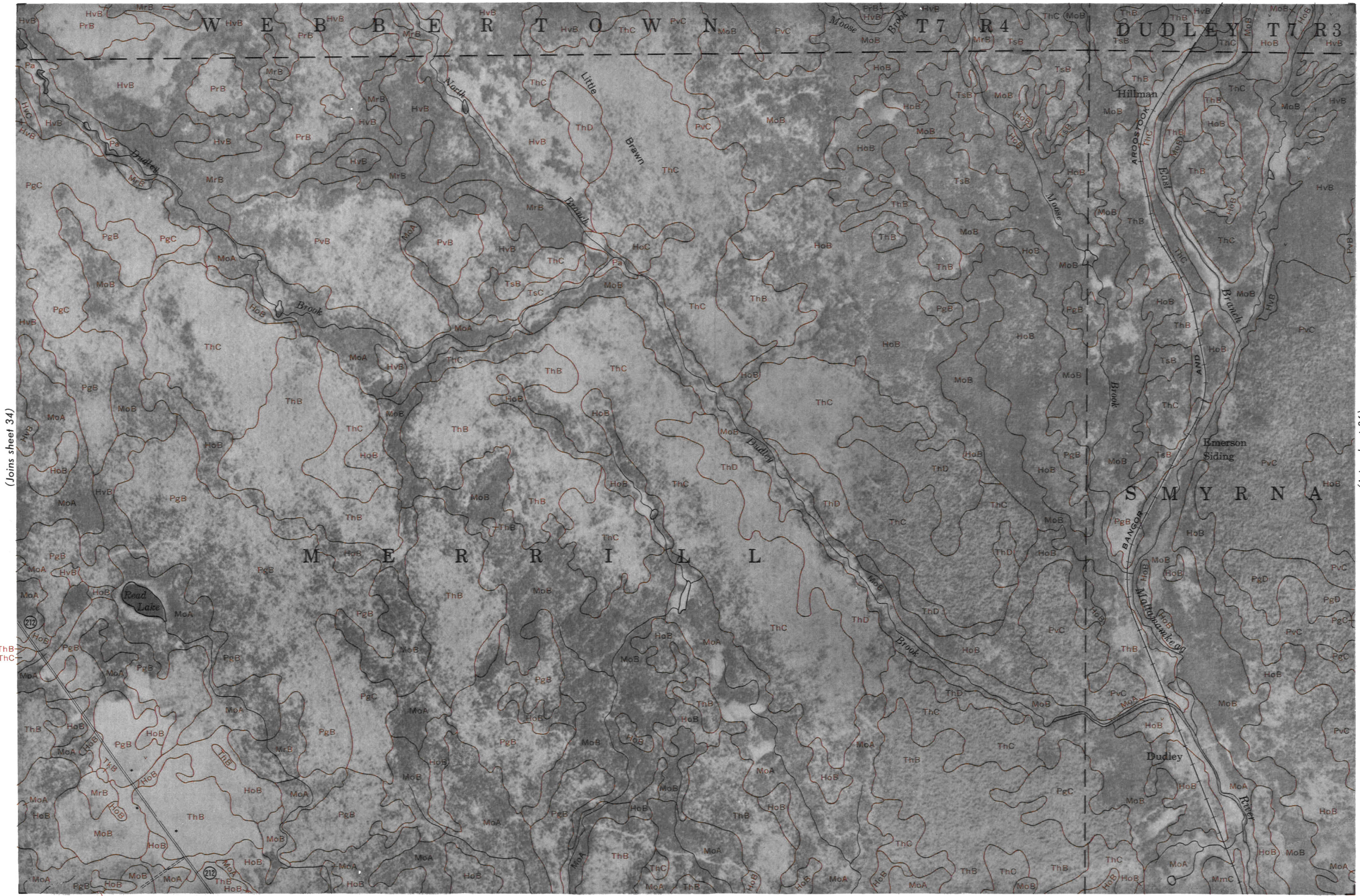
(Joins sheet 35)

(Joins sheet 41)

0 ½ 1 Mile Scale 1: 20000 0 5000 Feet

(Joins sheet 28)

(Joins sheet 34)



(Joins sheet 36)

(Joins sheet 42)

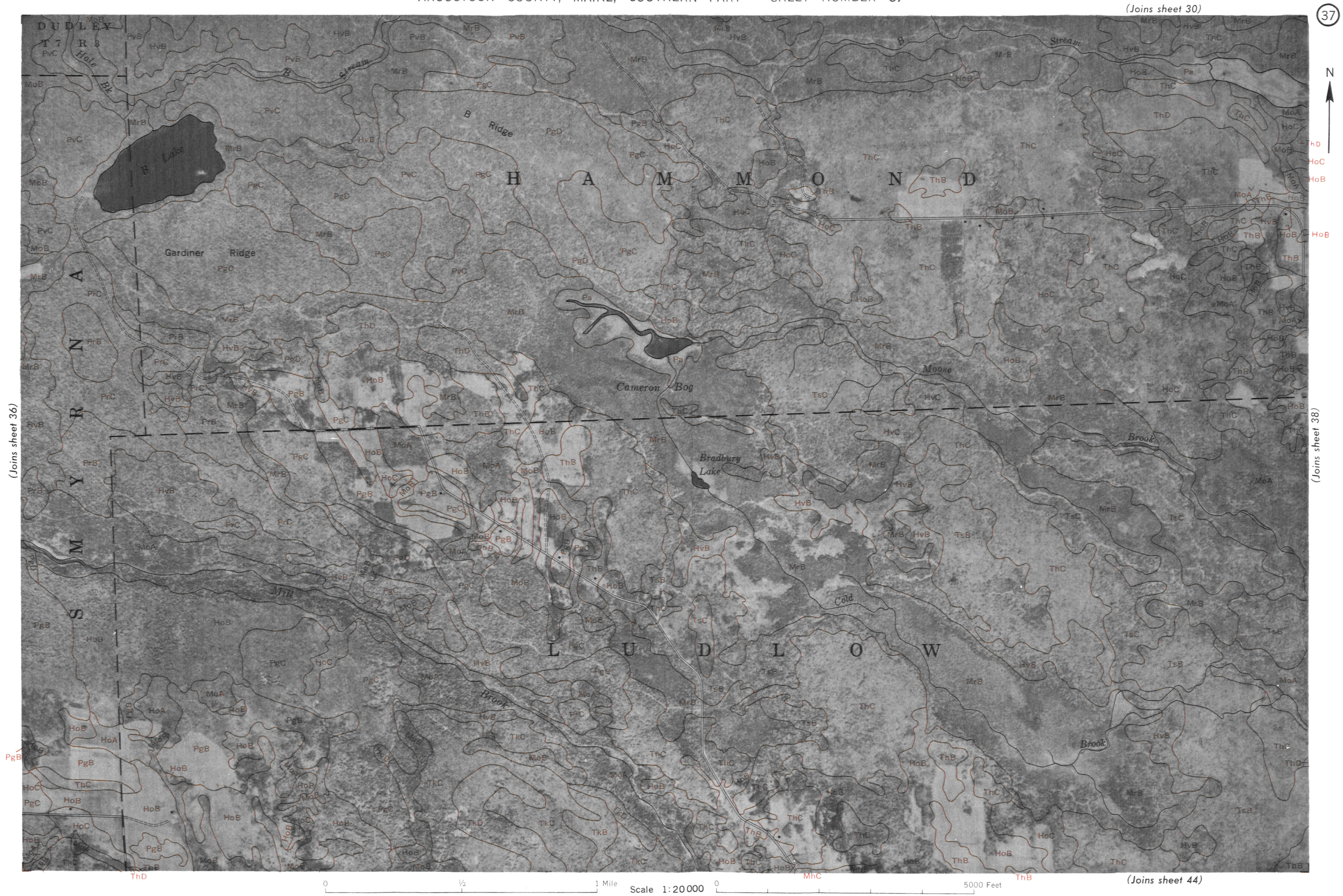
Scale 1:20 000

0 ½ 1 Mile

0 5 000 Feet

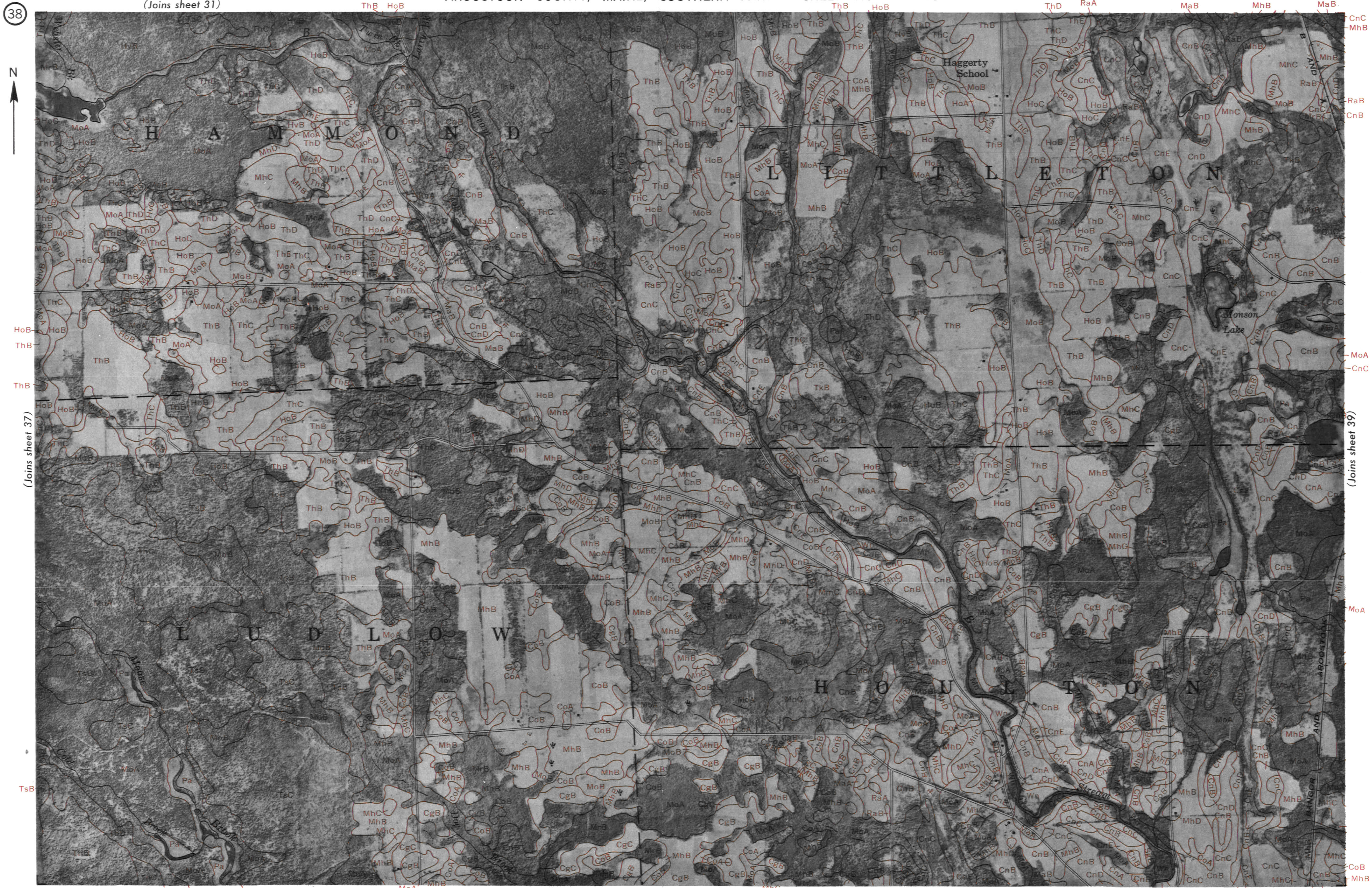
This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.


36
(Joins sheet 29)
N
DUDLEY T7 R3
Half Moon Pond
Rocky Ridge
Mill
Emerson Ridge
Duck Pond
SMYRNA
Moose Brook
Duck Brook
(Joins sheet 35)
(Joins sheet 37)
(Joins sheet 43)
0 ½ 1 Mile
Scale 1:20000
0 5000 Feet



This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

(Joins sheet 31)



(Joins sheet 45)

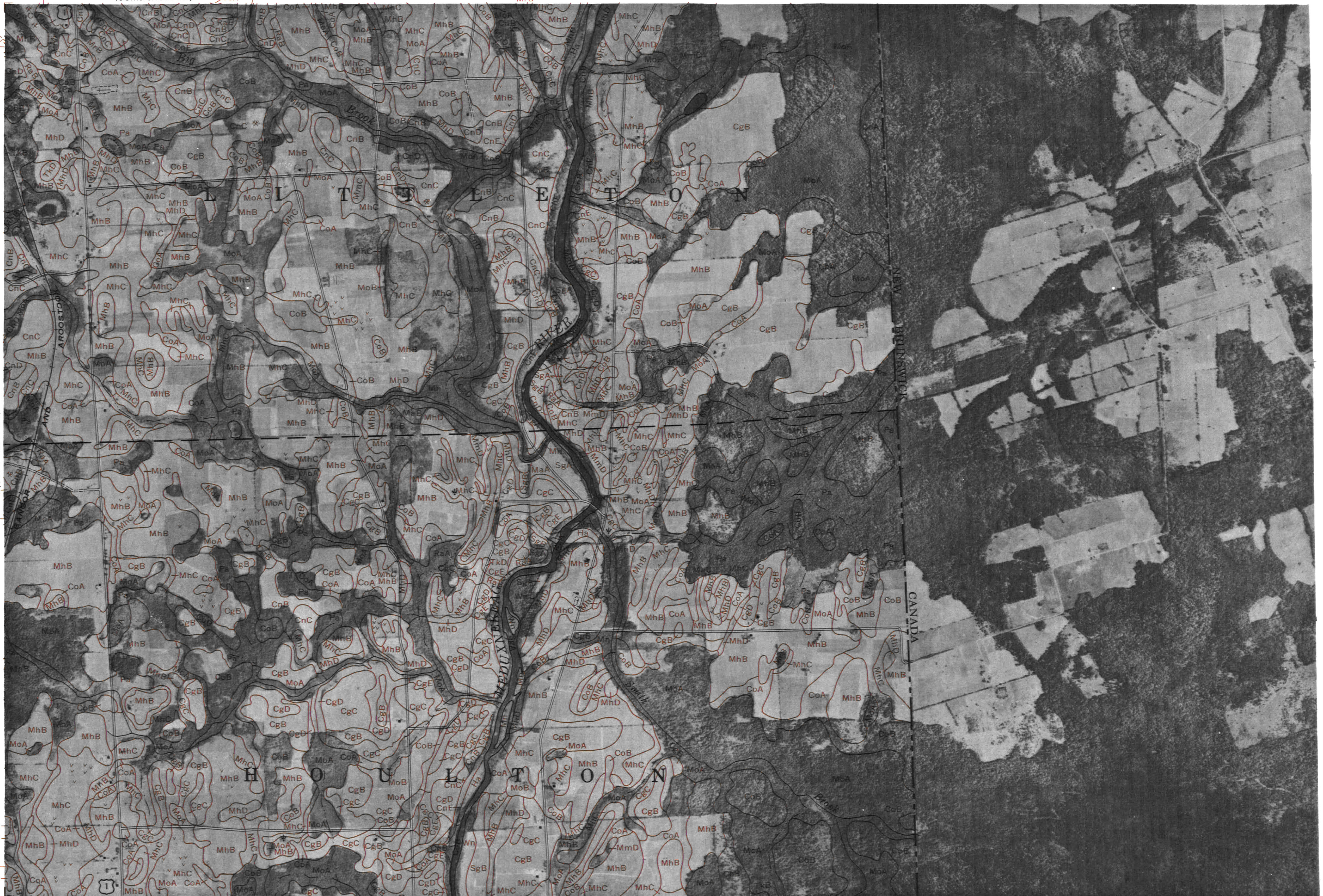
Scale 1:20000

0 ½ 1 Mile

0 5000 Feet

(Joins sheet 32)

(Joins sheet 38)



(Joins sheet 46)

Scale 1:20000

0 ½ 1 Mile

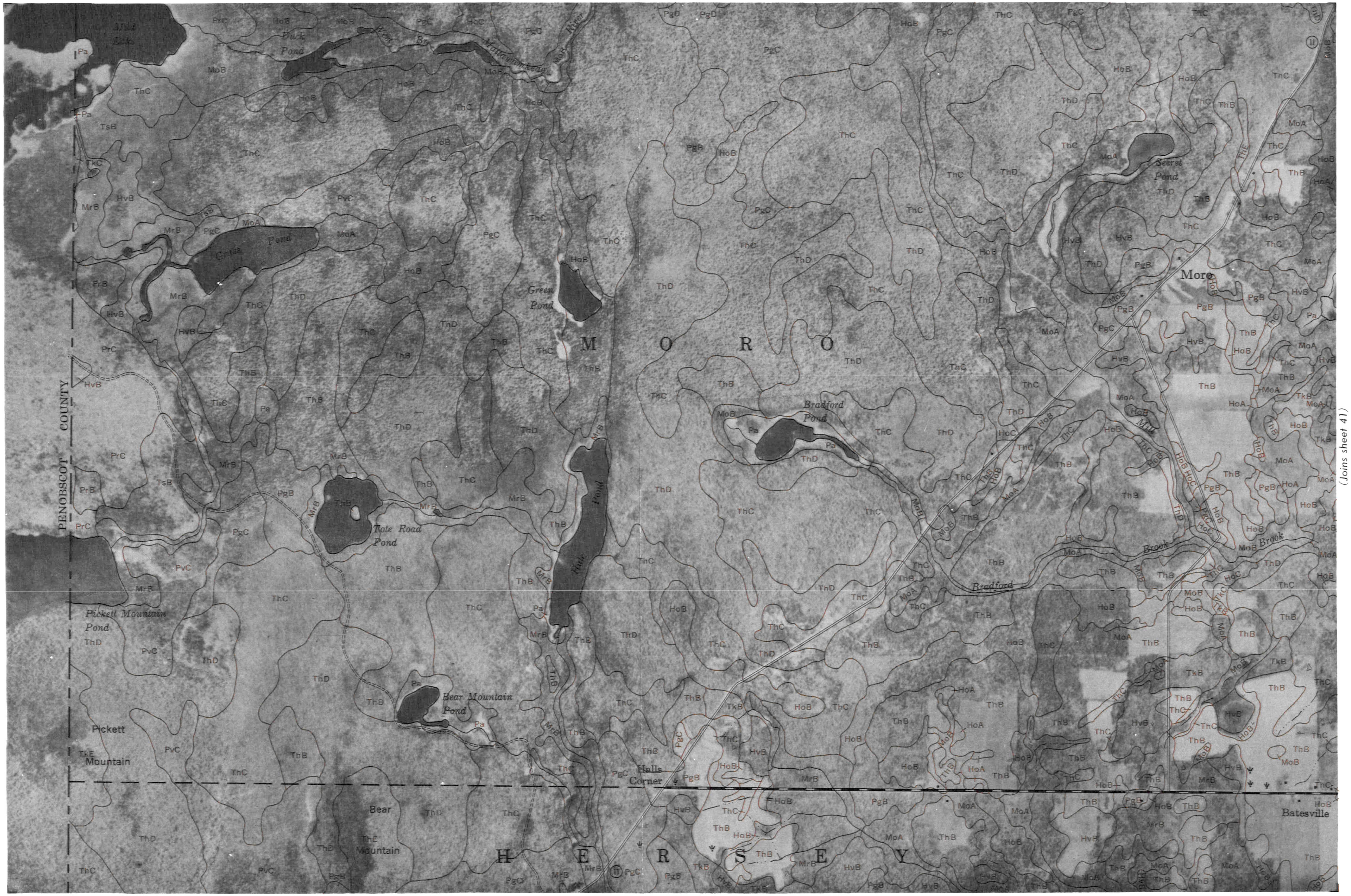
0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

40

(Joins sheet 33)

N



(Joins sheet 41)

(Joins sheet 47)

0 ½ 1 Mile

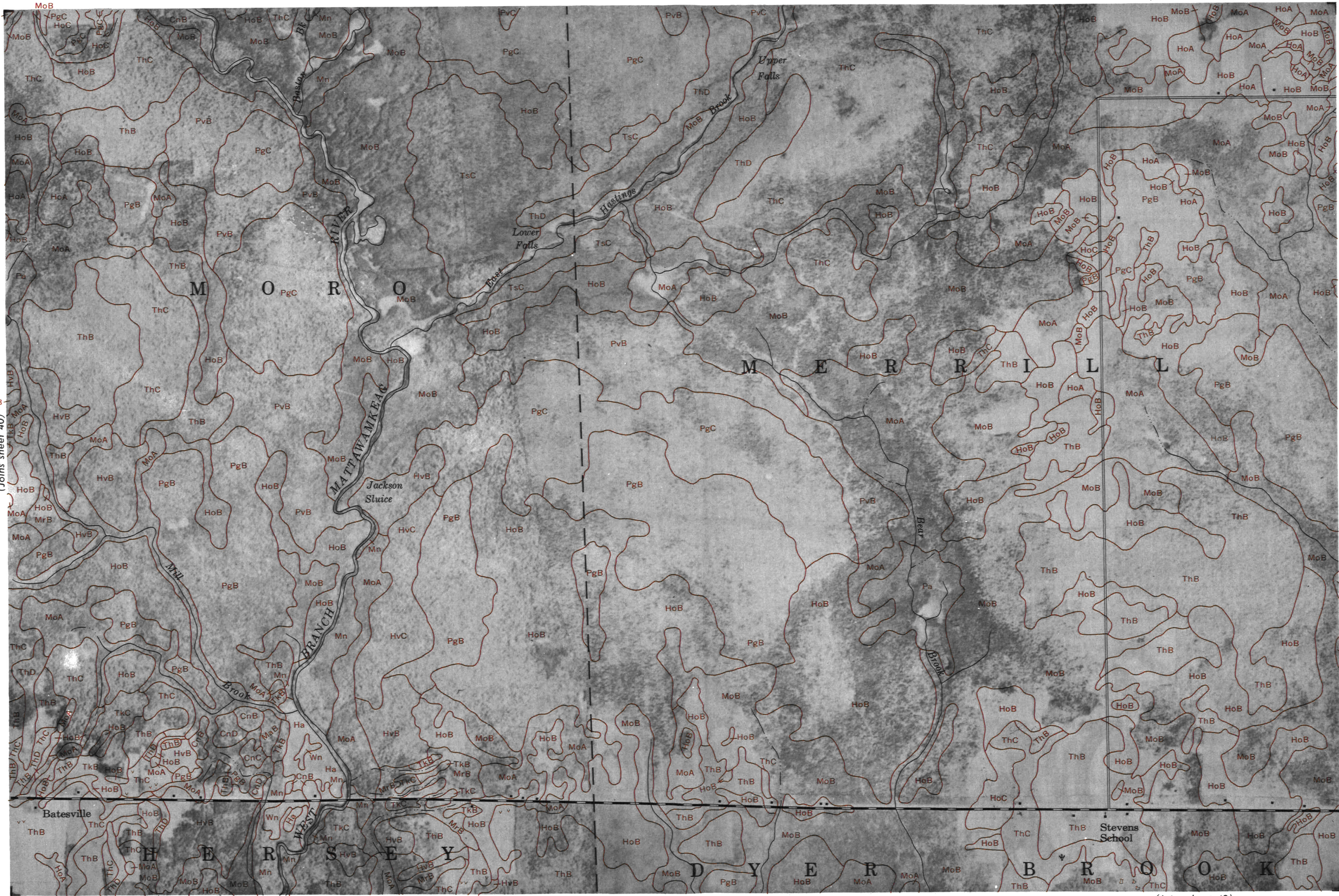
Scale 1:20000

0 5000 Feet

(Joins sheet 34)

(Joins sheet 40)

(Joins sheet 42)



(Joins sheet 48)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

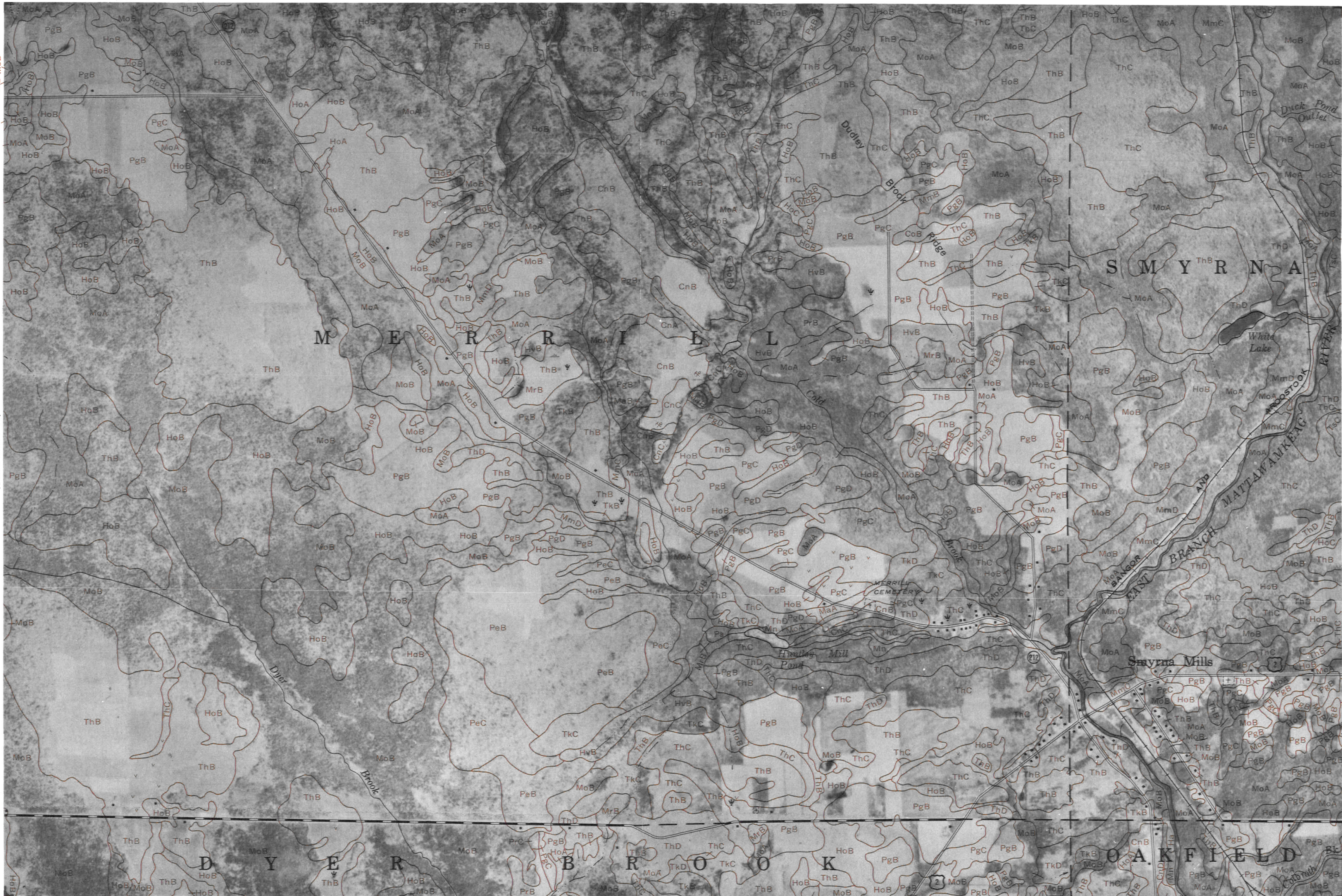
This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

42

(Joins sheet 35)

N

(Joins sheet 41)



(Joins sheet 43)

(Joins sheet 49)

0 ½ 1 Mile Scale 1: 20000 0 5000 Feet

(Joins sheet 36)

43

N

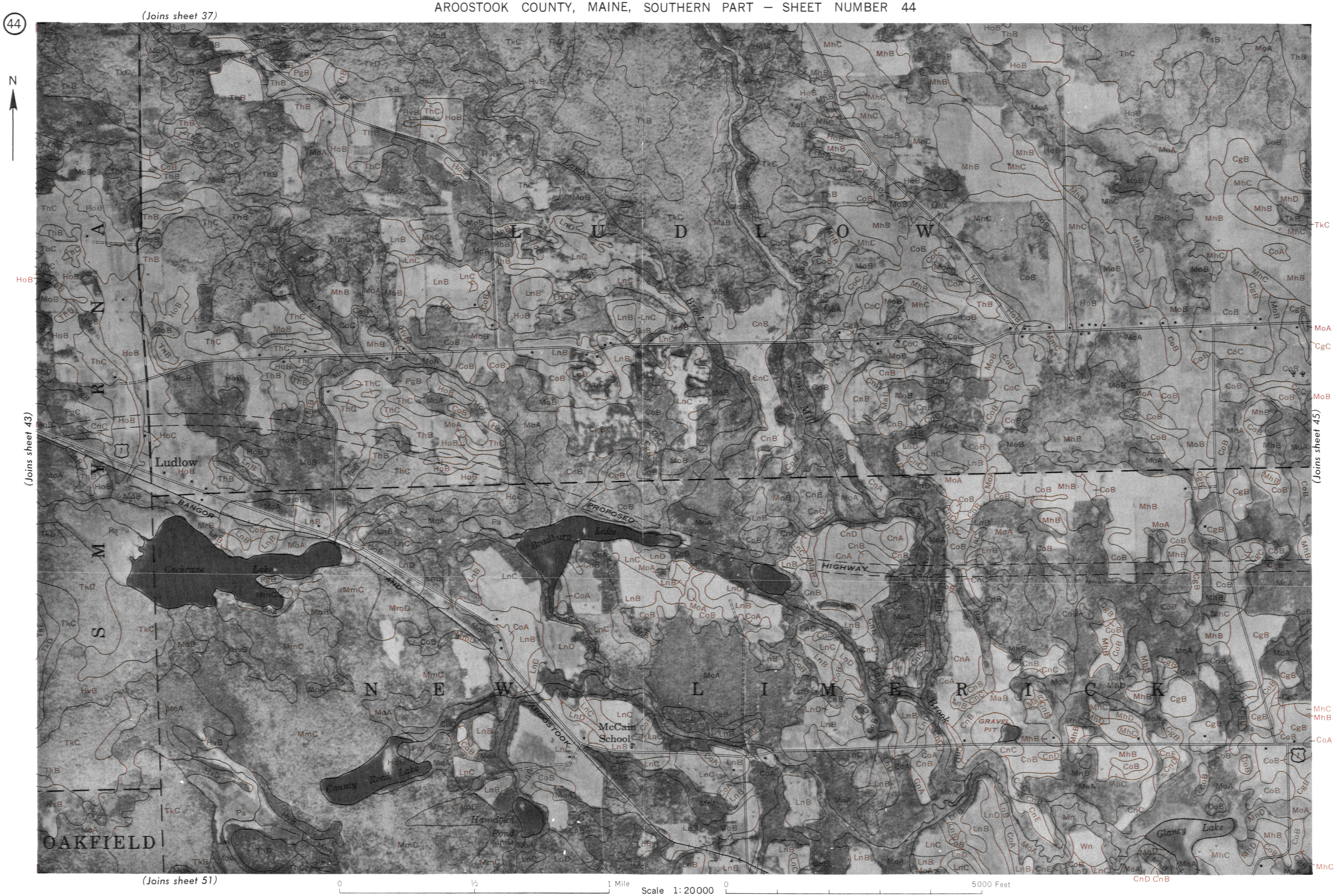
(Joins sheet 42)

(Joins sheet 44)

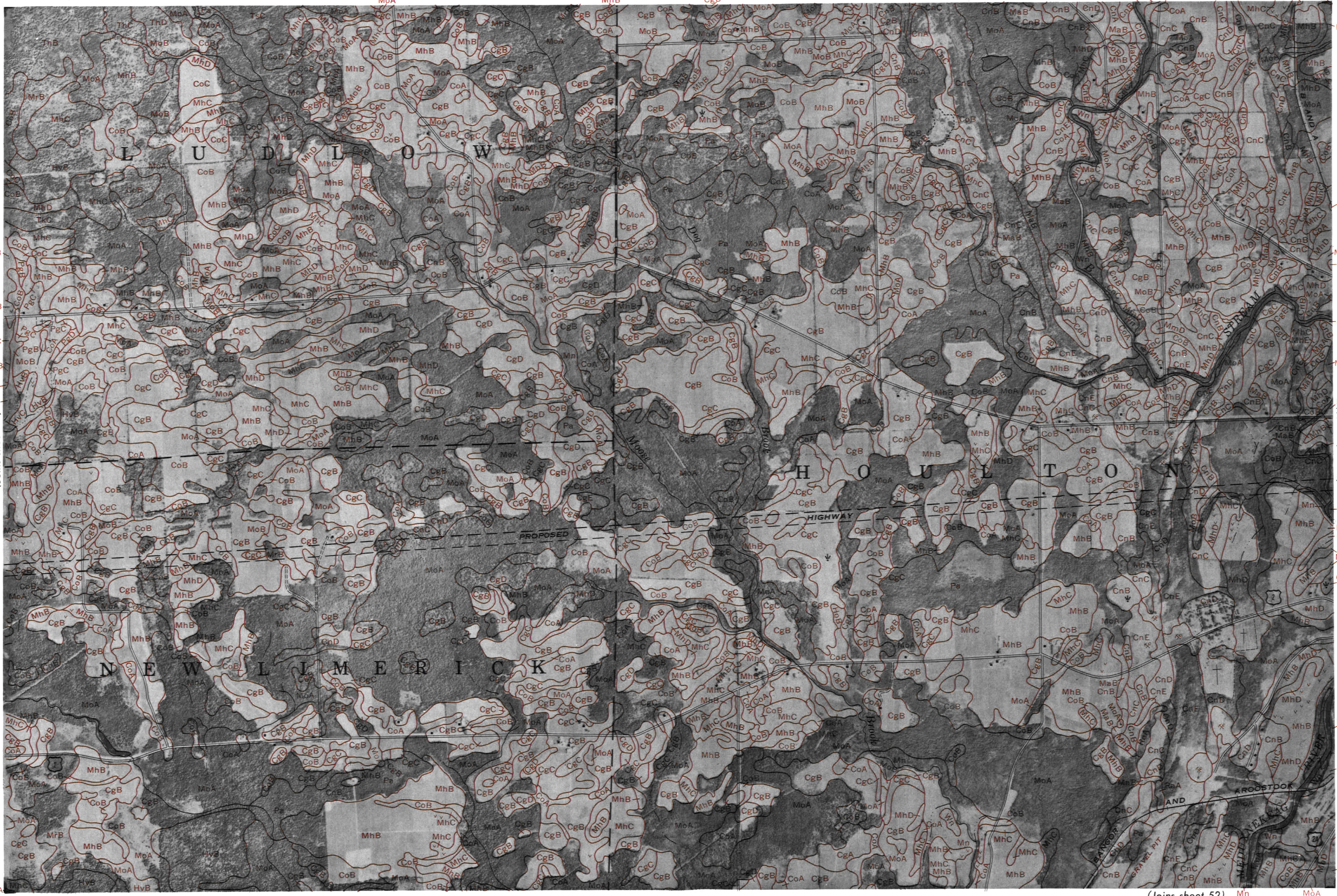
(Joins sheet 50)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.


(Joins sheet 37)
(Joins sheet 43)
(Joins sheet 45)
(Joins sheet 51)
N
L U D L O W
N E W L I M E R I C K
M A S Y R N A
OAKFIELD
Ludlow
McCain School
Cochrane Lake
Bradbury Lake
County Road Lake
Hawaiian Pond
Glancy Lake
Lamb Brook
Mill Brook
BANGOR AND AROOSTOOK
PROPOSED HIGHWAY
GRAVEL PIT
0 ½ 1 Mile
Scale 1:20000
0 5000 Feet

(Joins sheet 38)



(Joins sheet 44)

(Joins sheet 46)

(Joins sheet 52)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

46

(Joins sheet 39)

N

(Joins sheet 45)

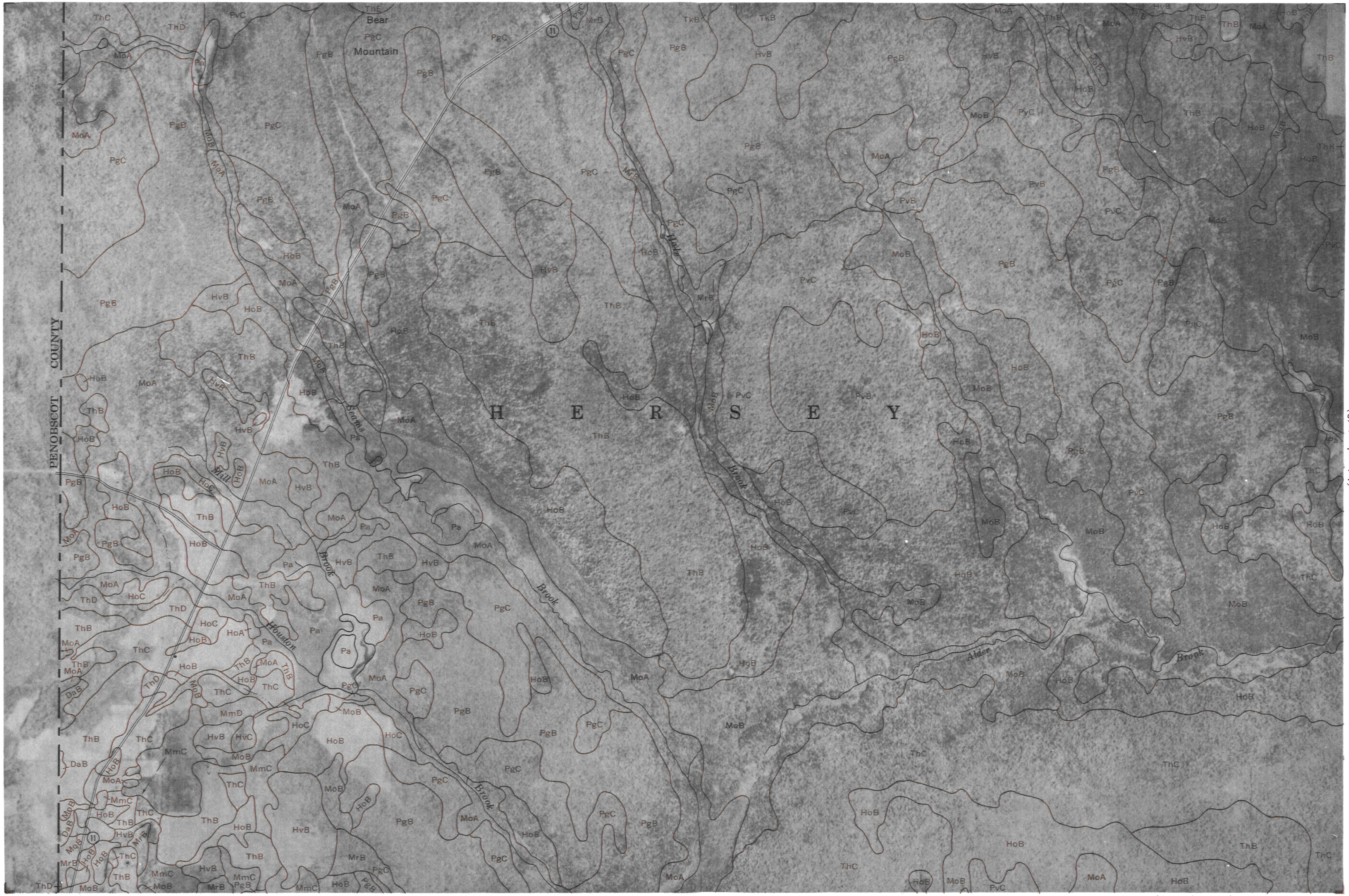
(Joins sheet 53)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 40)

47

N



(Joins sheet 48)

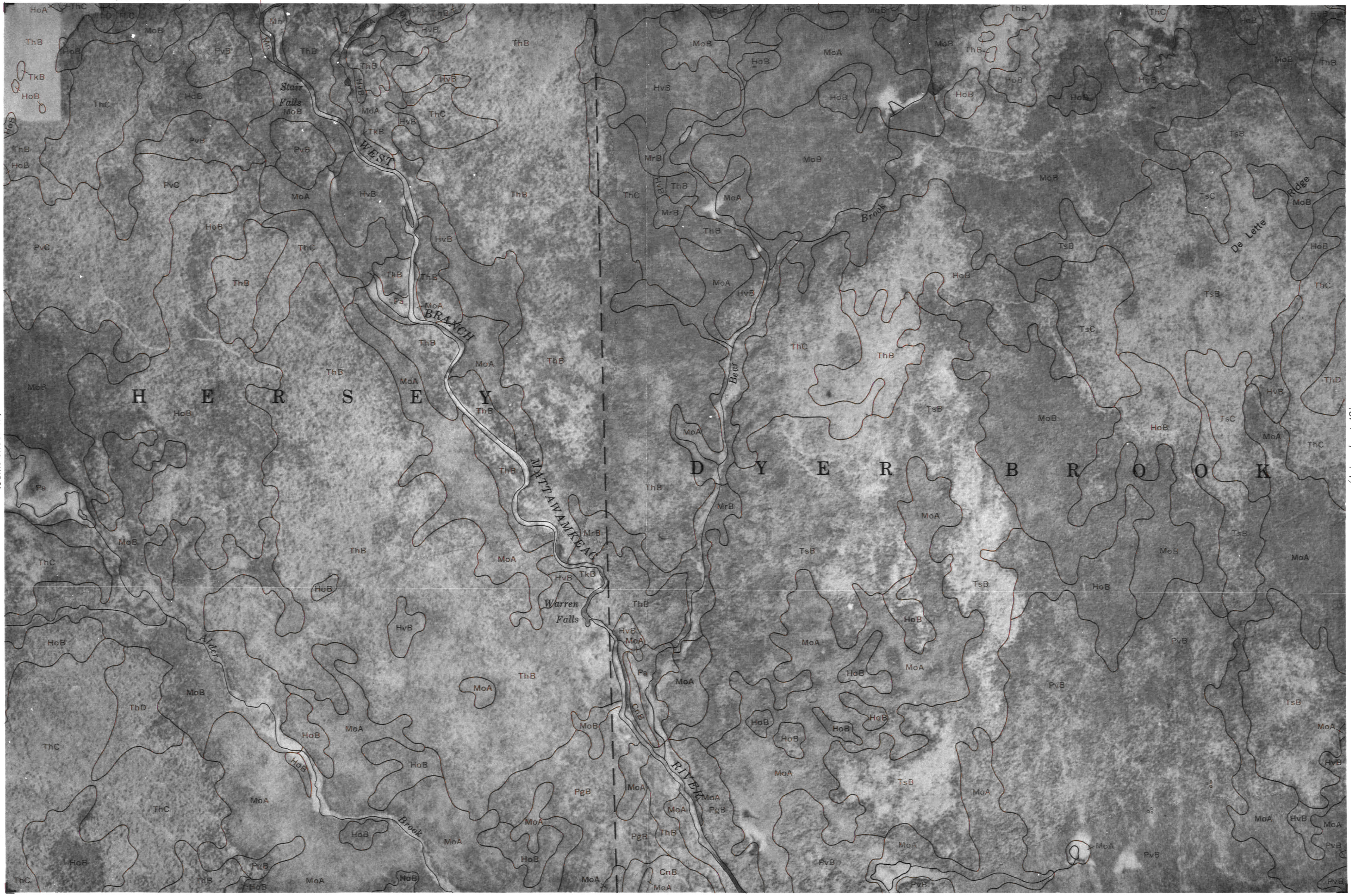
(Joins sheet 54)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

(Joins sheet 41)

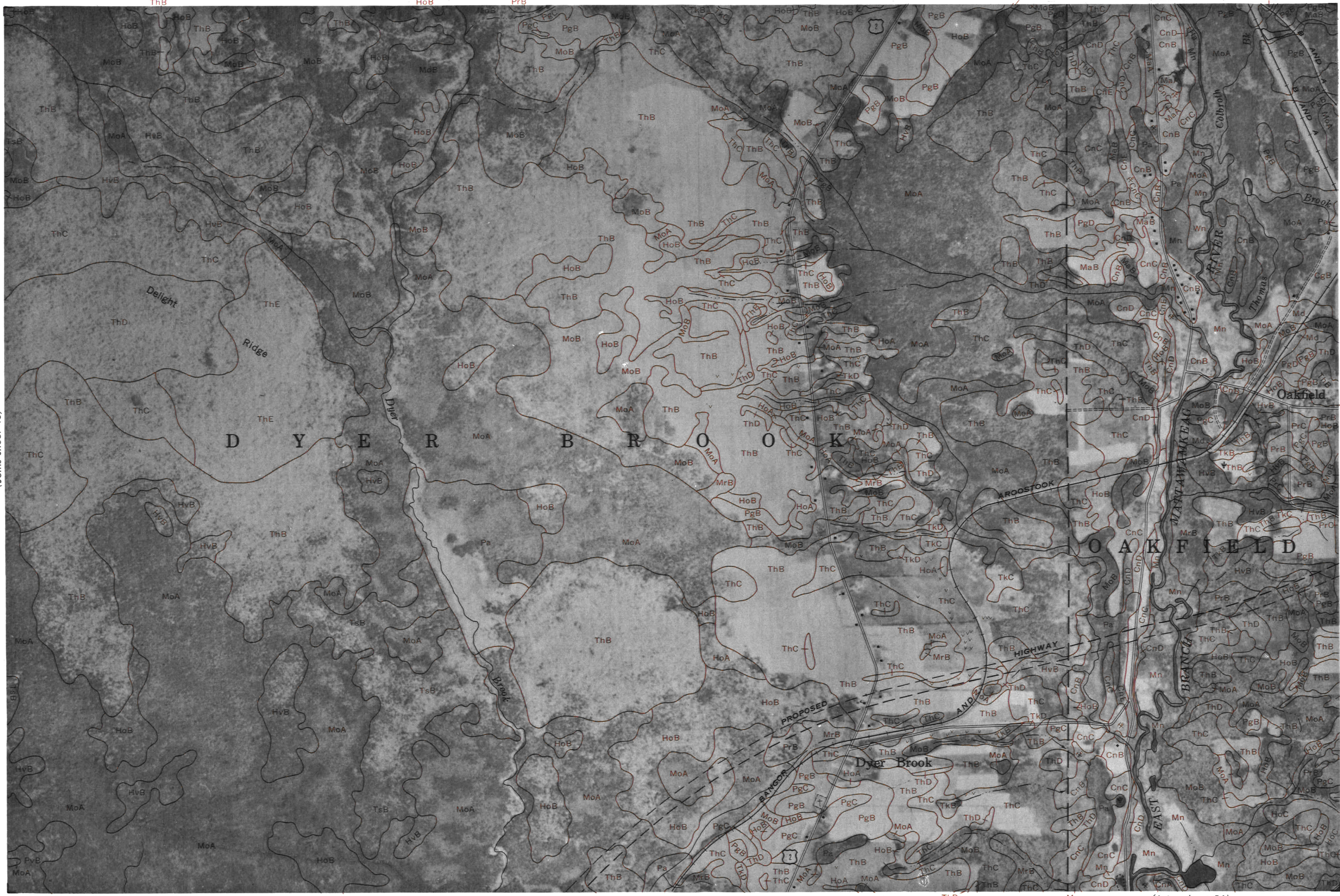
(Joins sheet 47)



(Joins sheet 49)

(Joins sheet 55)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet



Scale 1:20000

0 ½ 1 Mile

0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

(Joins sheet 43)

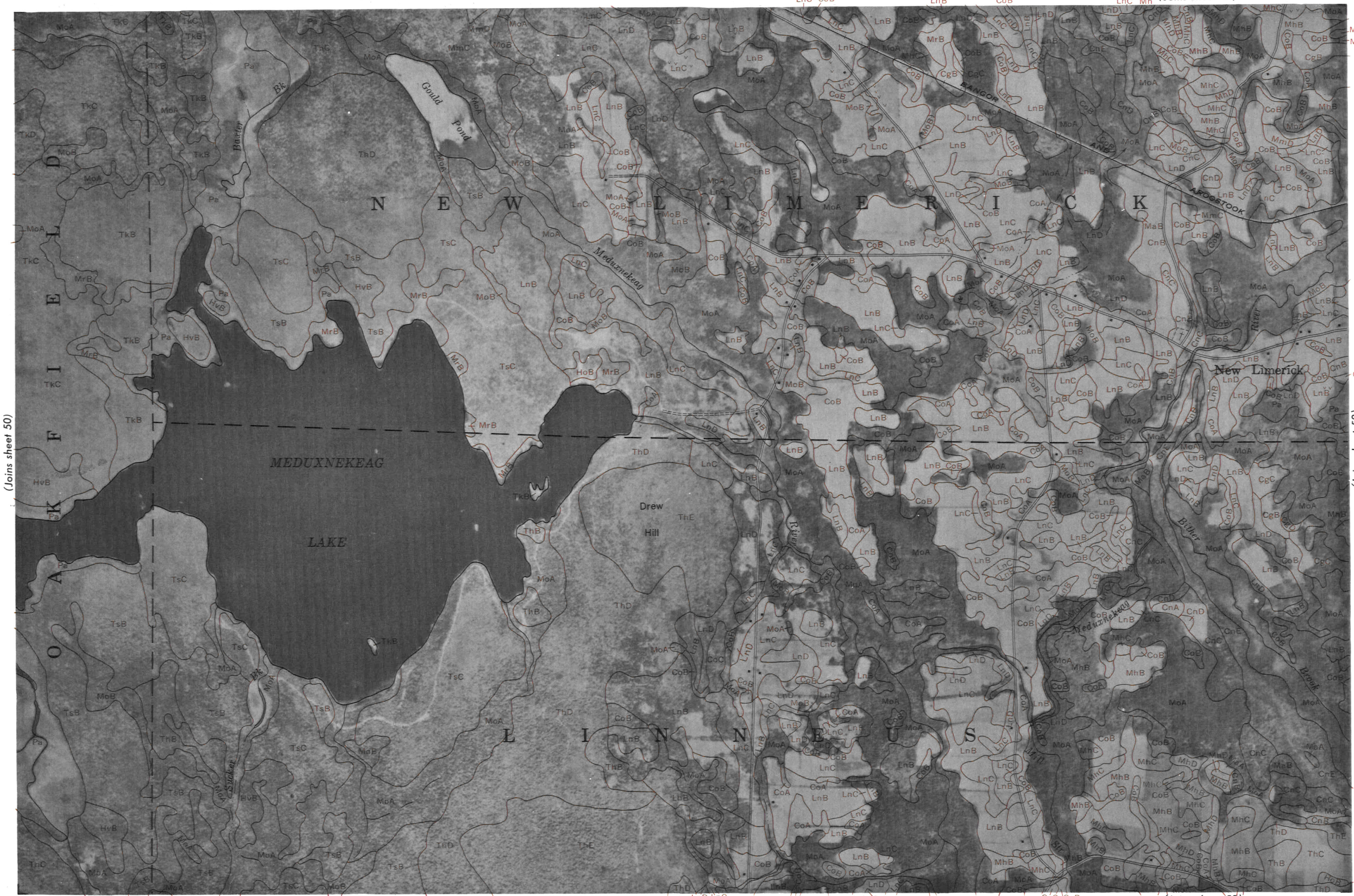
(Joins sheet 49)

(Joins sheet 51)

(Joins sheet 57)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 44)



(Joins sheet 50)

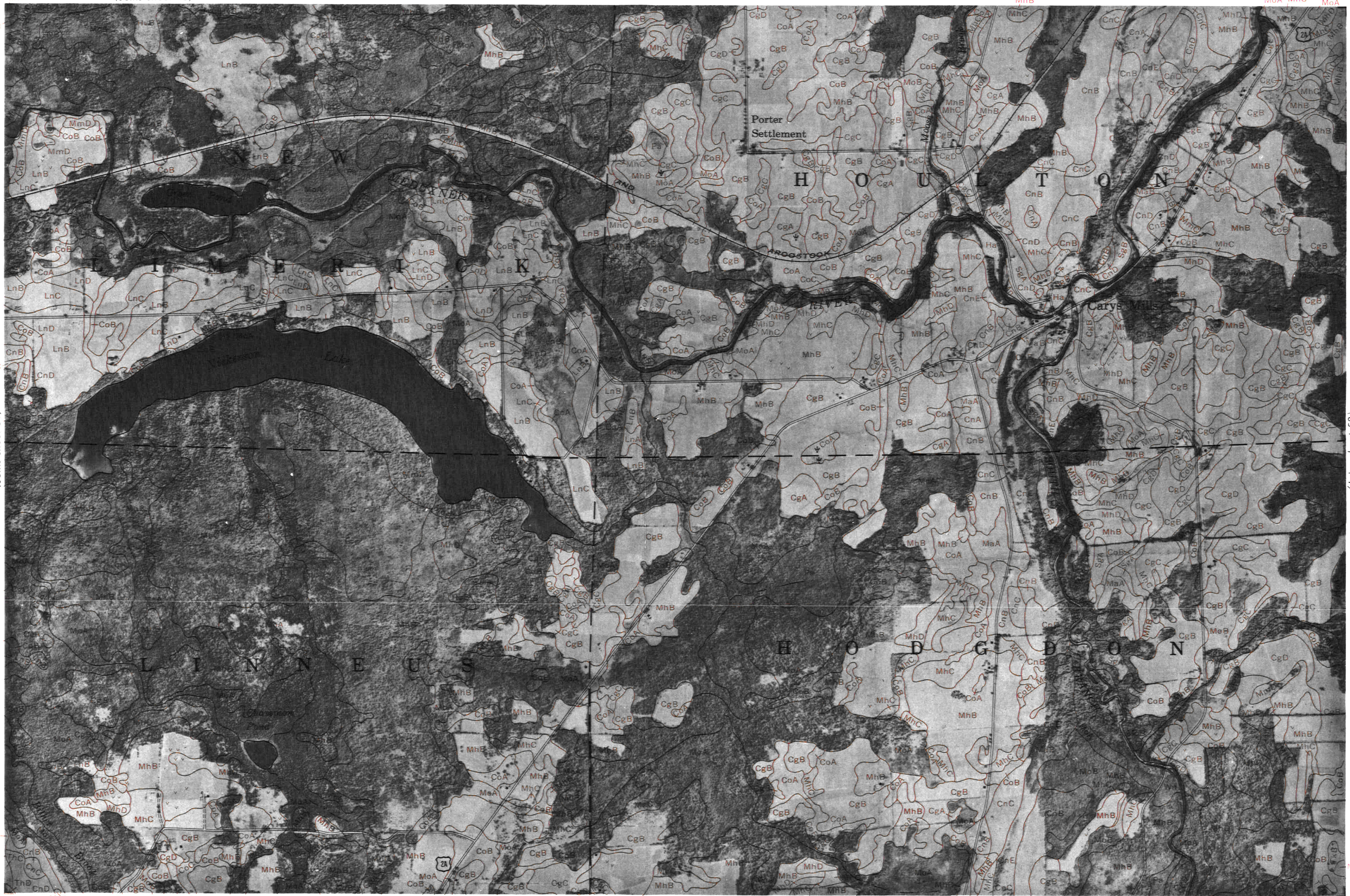
(Joins sheet 52)

(Joins sheet 58)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

AROOSTOOK COUNTY, MAINE, SOUTHERN PART — SHEET NUMBER 52



Scale 1:20000

0 ½ 1 Mile

0 5000 Feet

(Joins sheet 46)

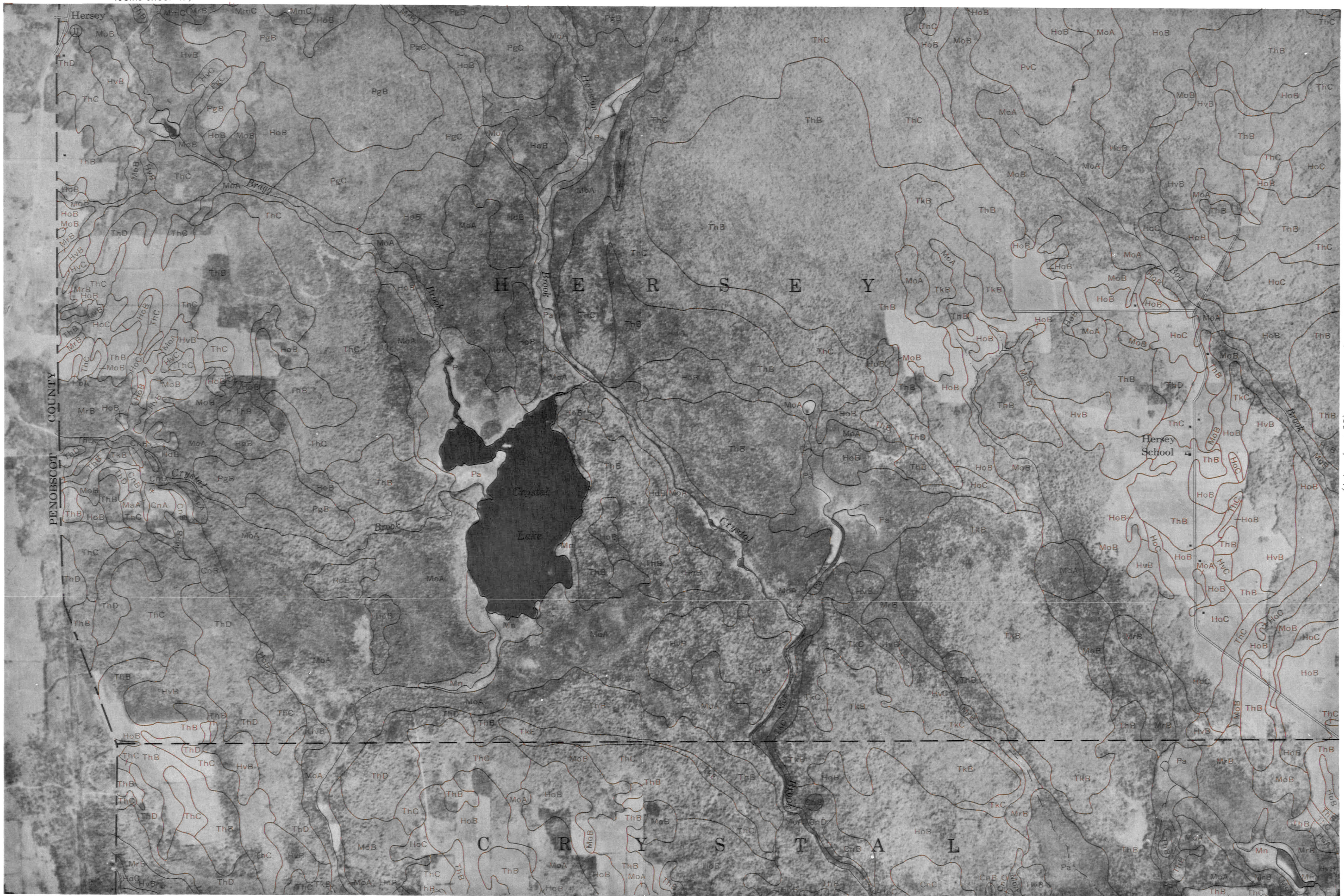
(Joins sheet 52)

(Joins sheet 60)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

(Joins sheet 47)



(Joins sheet 55)

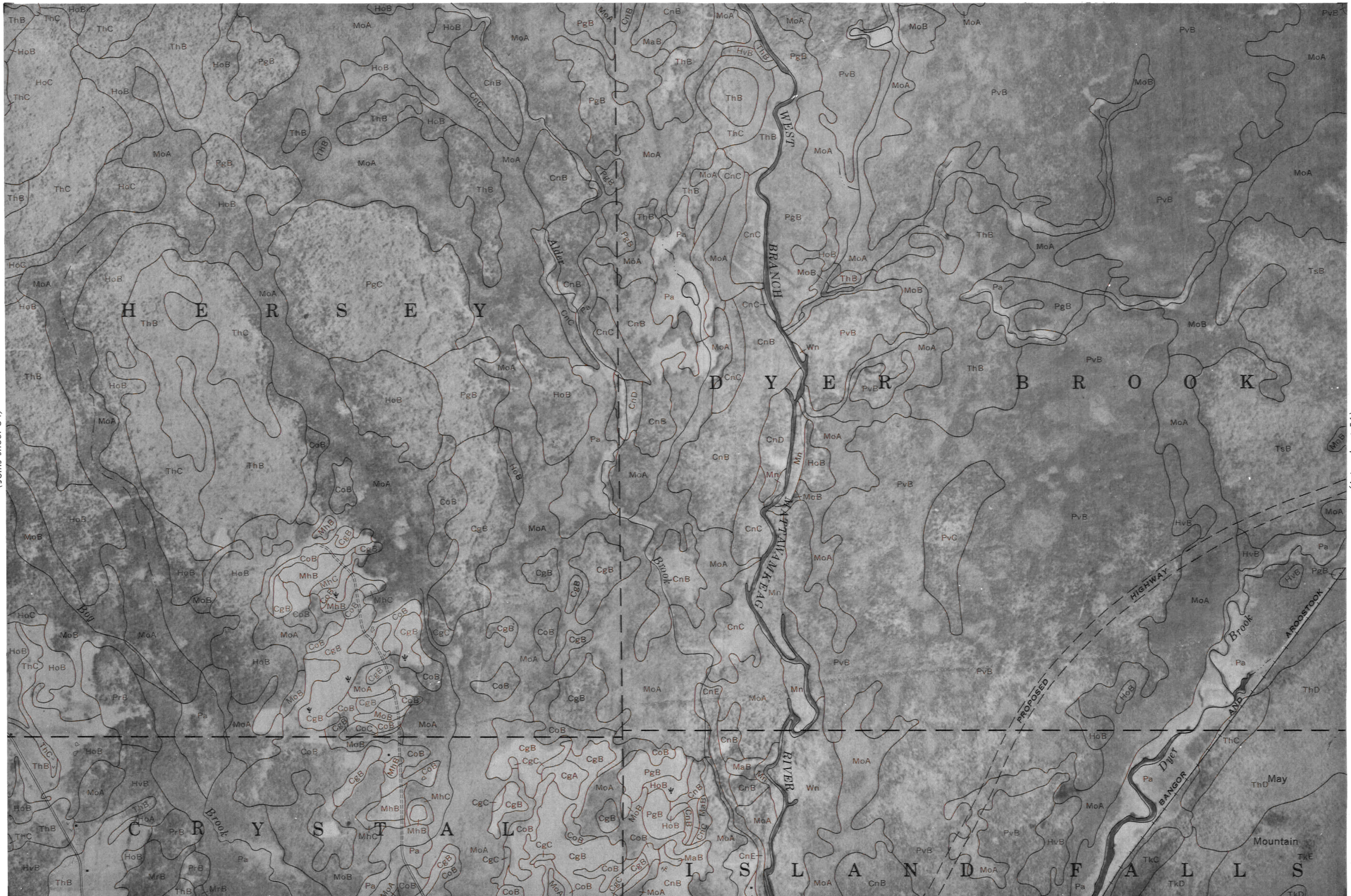
(Joins sheet 61)

0 ½ 1 Mile
Scale 1:20000
0 5000 Feet

(Joins sheet 48)

55

(Joins sheet 54)



(Joins sheet 56)

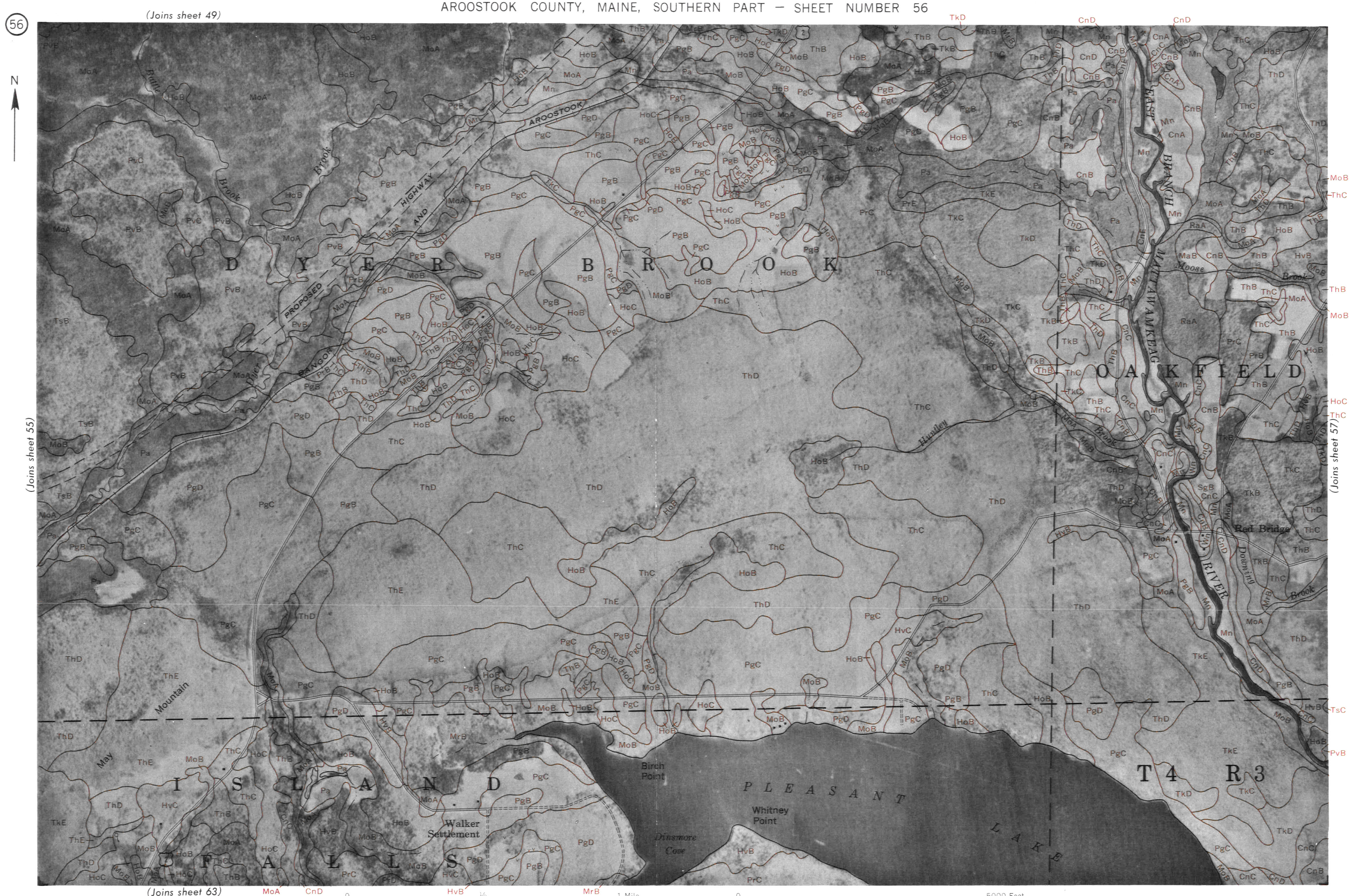
(Joins sheet 62)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

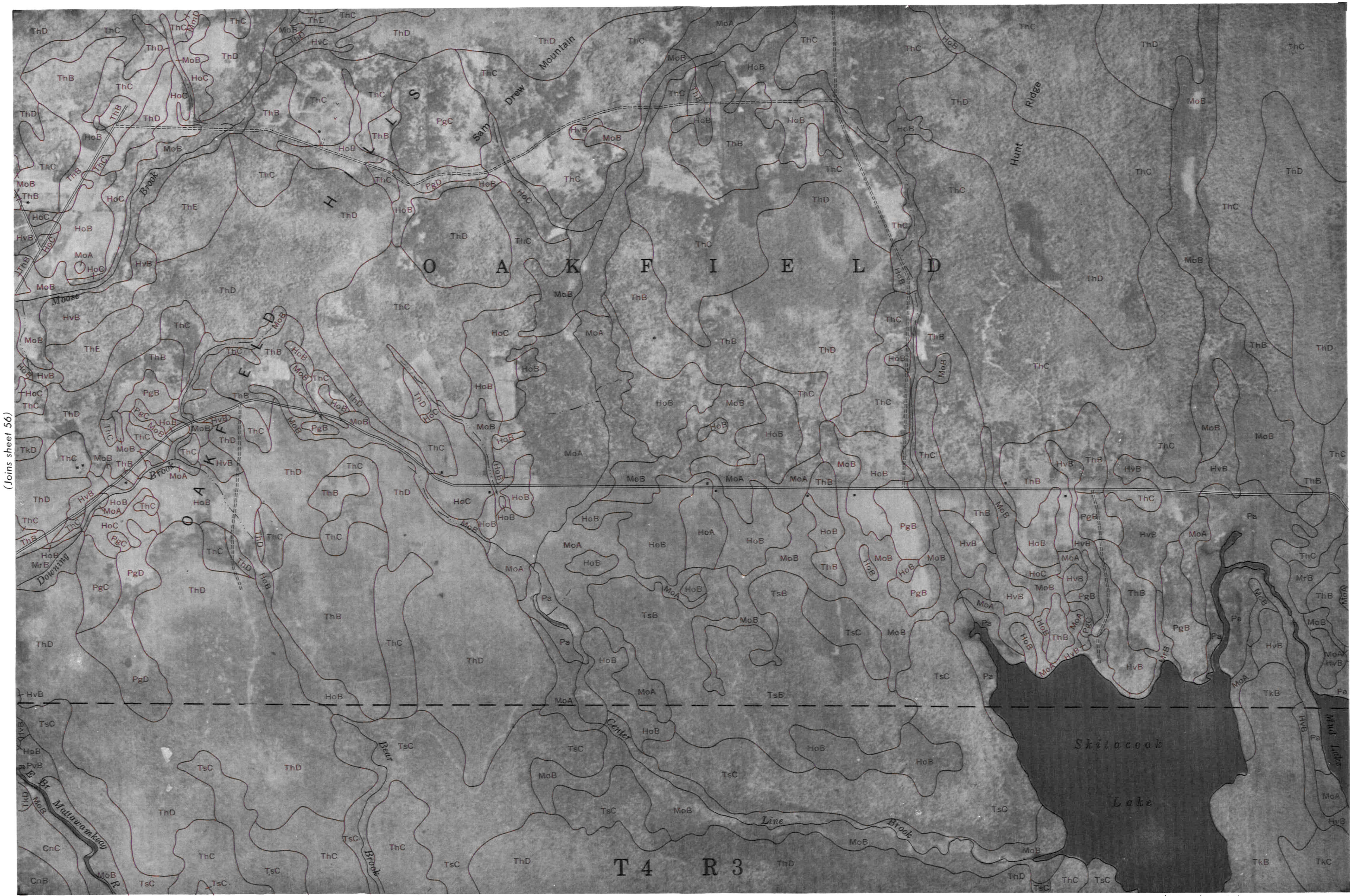
This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.



0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 50)

(Joins sheet 56)



(Joins sheet 58)

(Joins sheet 64)

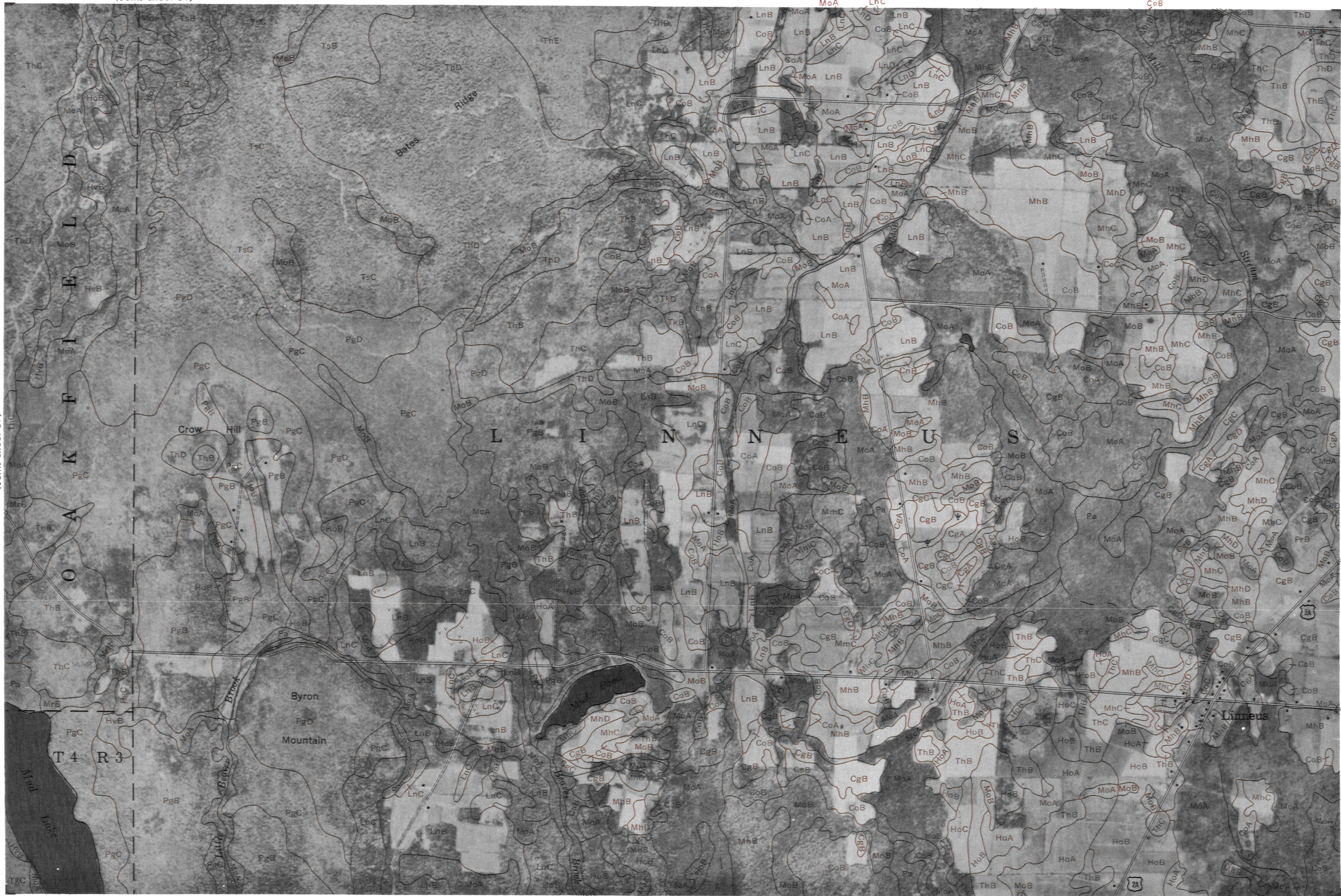
0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

(Joins sheet 51)

N

(Joins sheet 57)



(Joins sheet 59)

(Joins sheet 65)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

AROOSTOOK COUNTY, MAINE, SOUTHERN PART — SHEET NUMBER 59

59

(Joins sheet 52)

N

(Joins sheet 58)

(Joins sheet 60)

(Joins sheet 66)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

(Joins sheet 53)

N

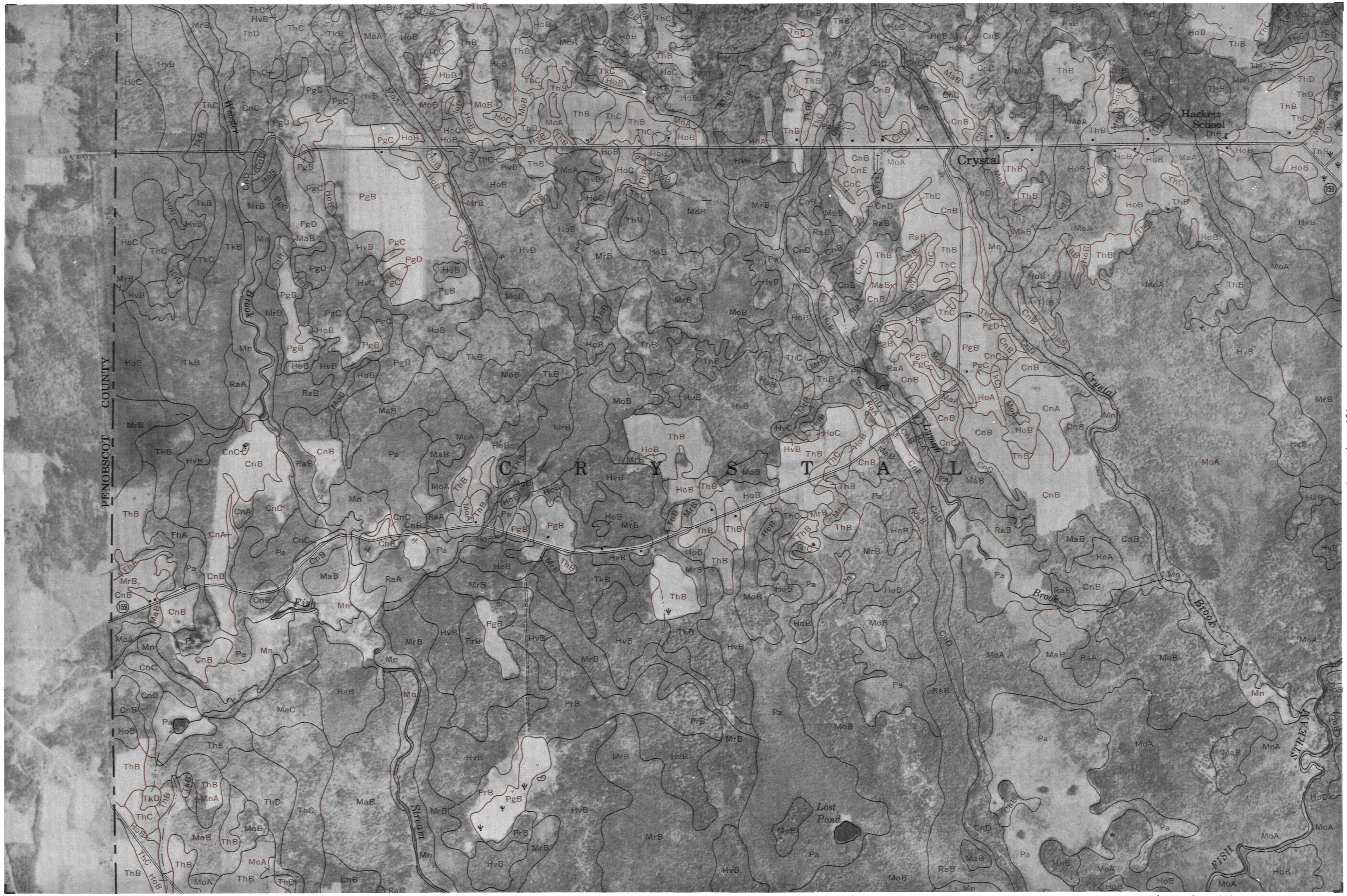
(Joins sheet 59)

(Joins sheet 67)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 54)

61



(Joins sheet 62)

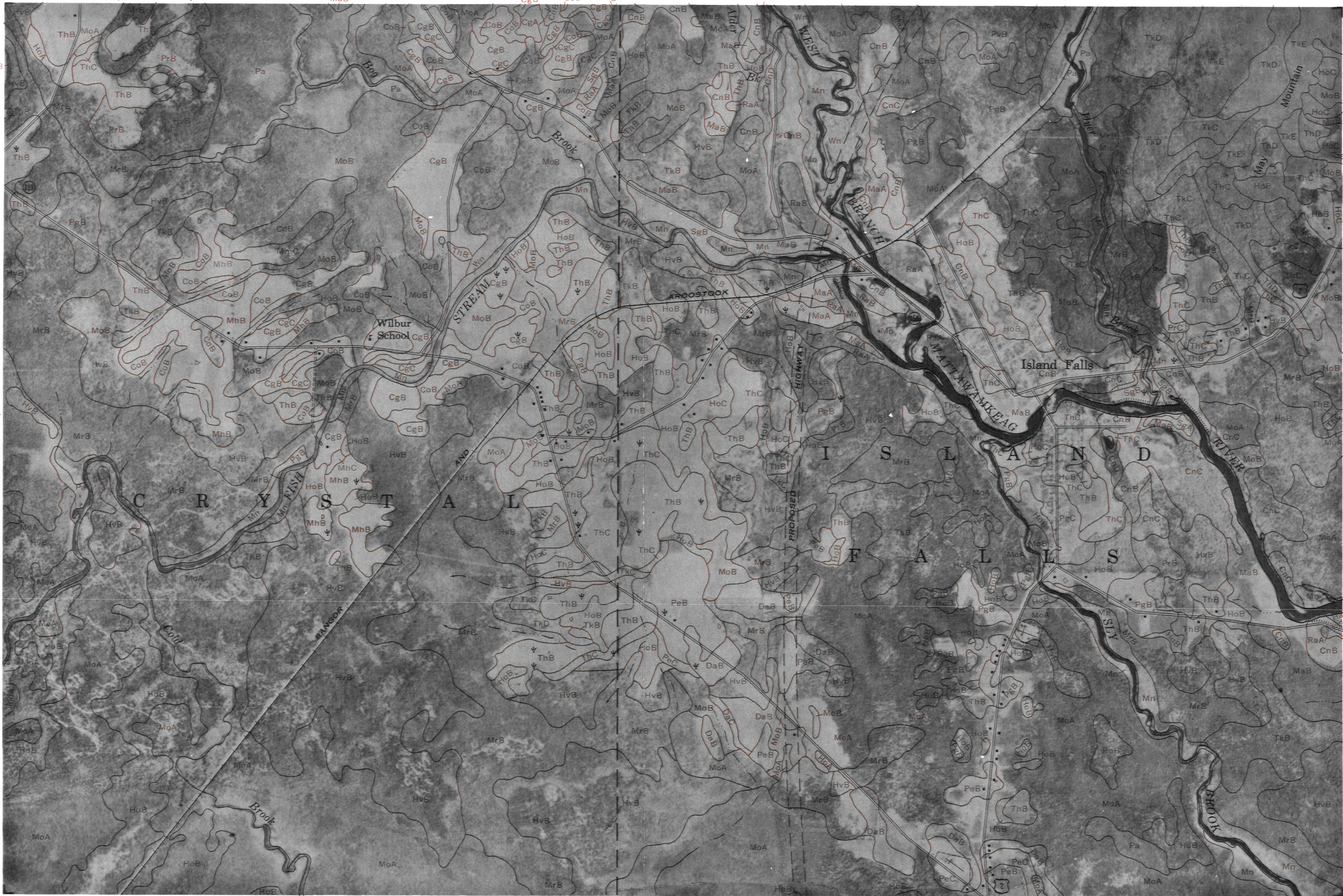
(Joins sheet 68)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

(Joins sheet 55)

(Joins sheet 61)



(Joins sheet 63)

(Joins sheet 69)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 56)

(Joins sheet 62)

(Joins sheet 64)

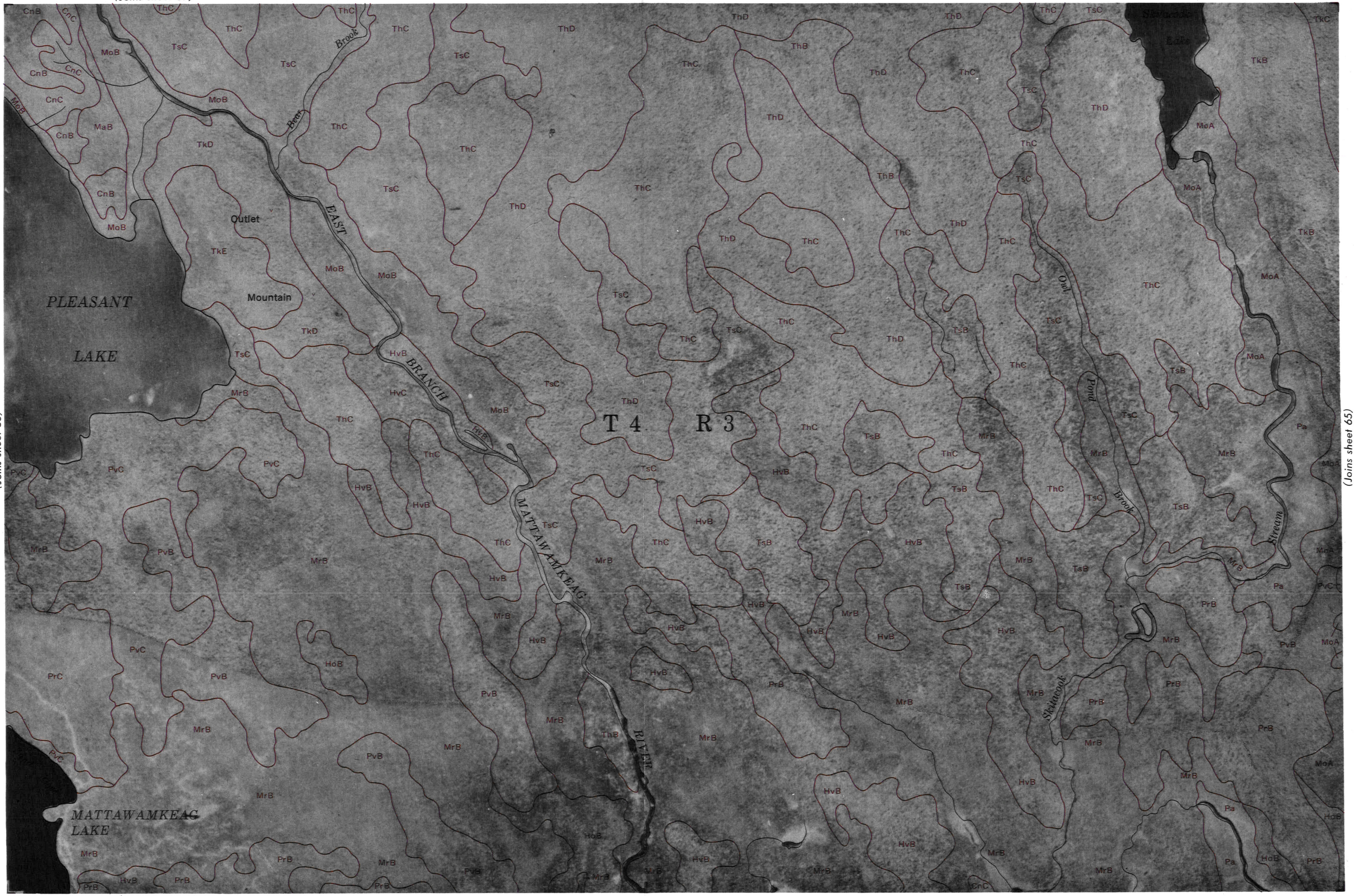
This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 70)

64

(Joins sheet 57)



(Joins sheet 63)

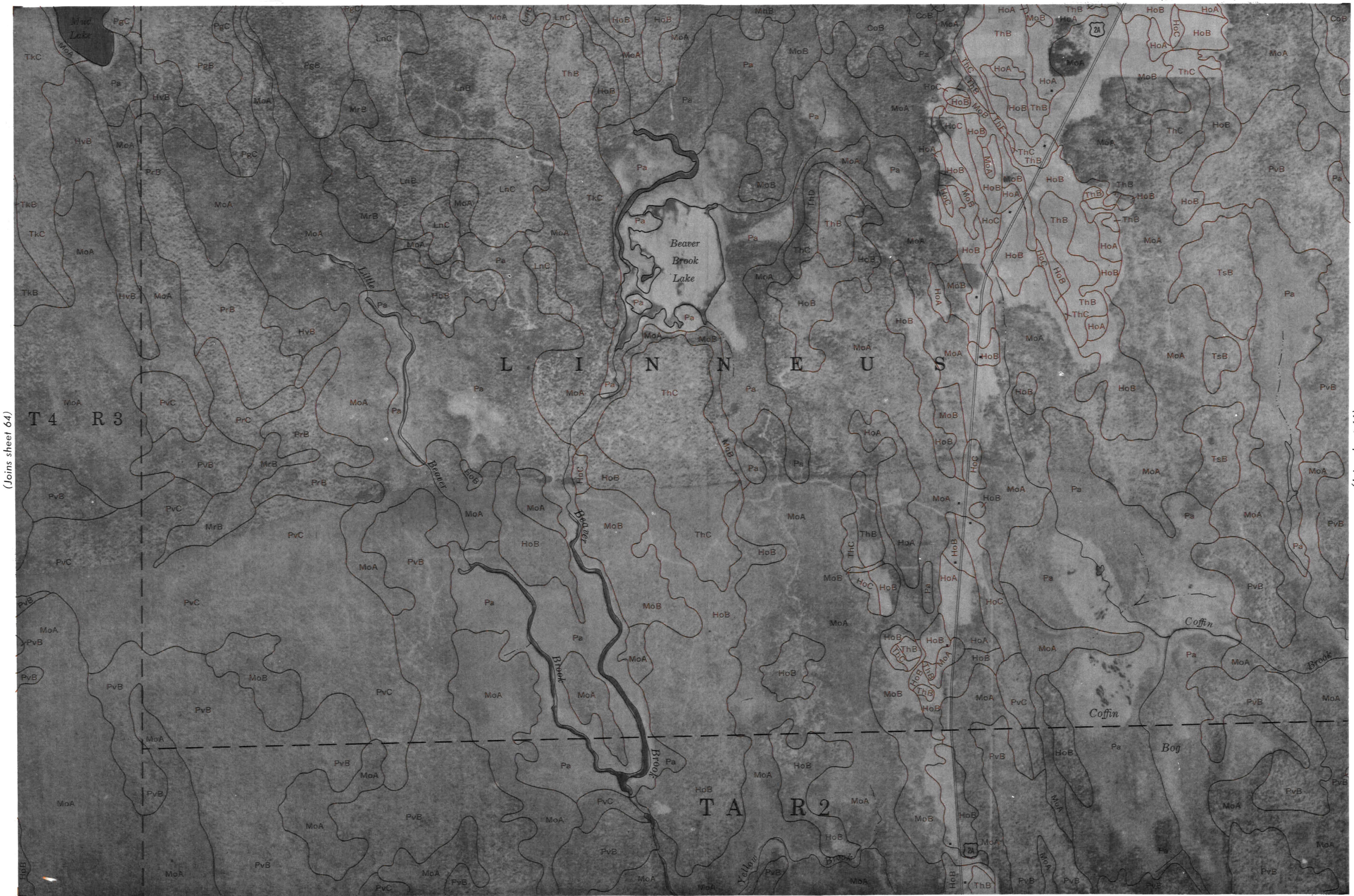
(Joins sheet 65)

(Joins sheet 71)

0 ½ 1 Mile Scale 1: 20000 0 5000 Feet

(Joins sheet 58)

(Joins sheet 64)



(Joins sheet 66)

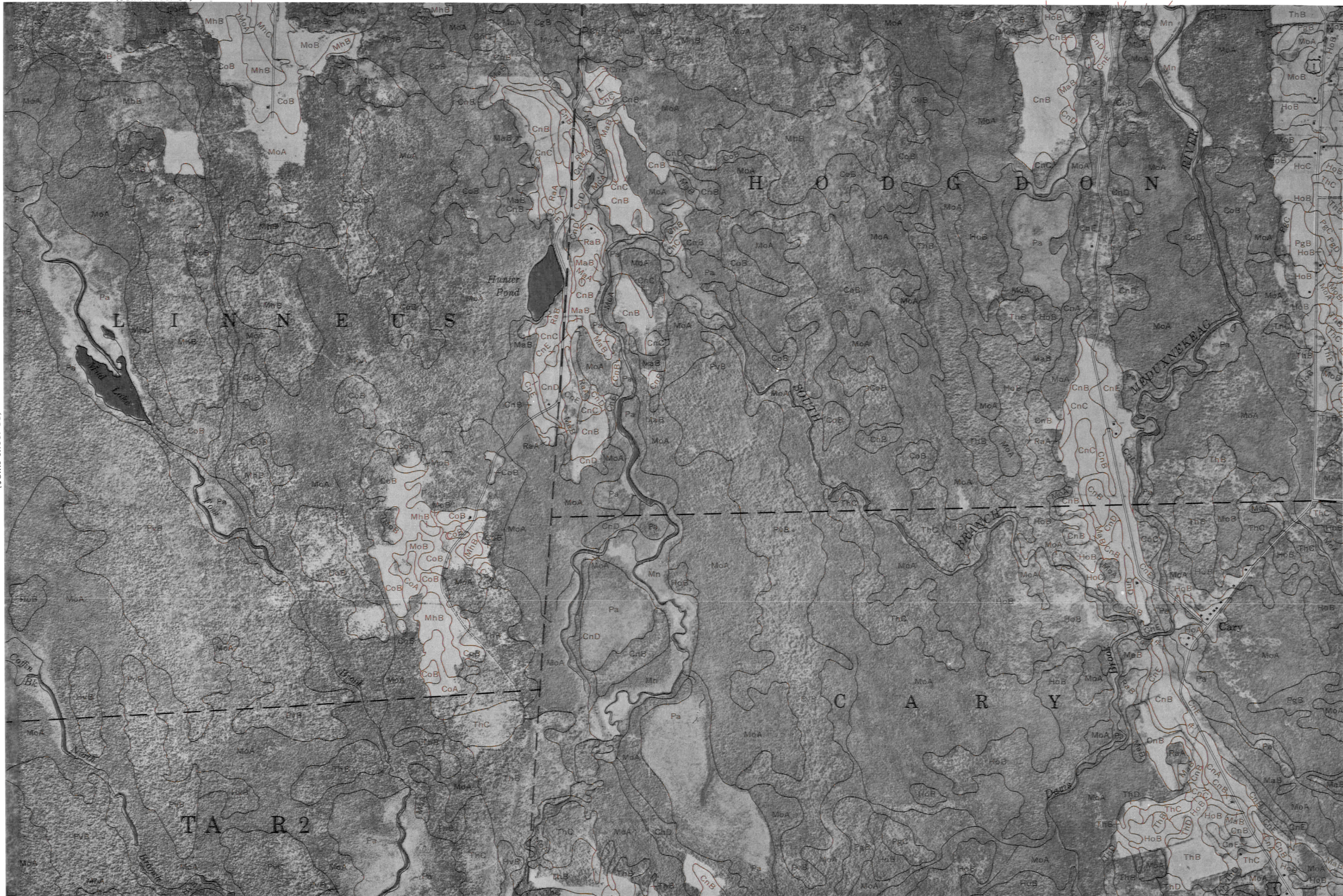
(Joins sheet 72)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

AROOSTOOK COUNTY, MAINE, SOUTHERN PART — SHEET NUMBER 66

(Joins sheet 59)

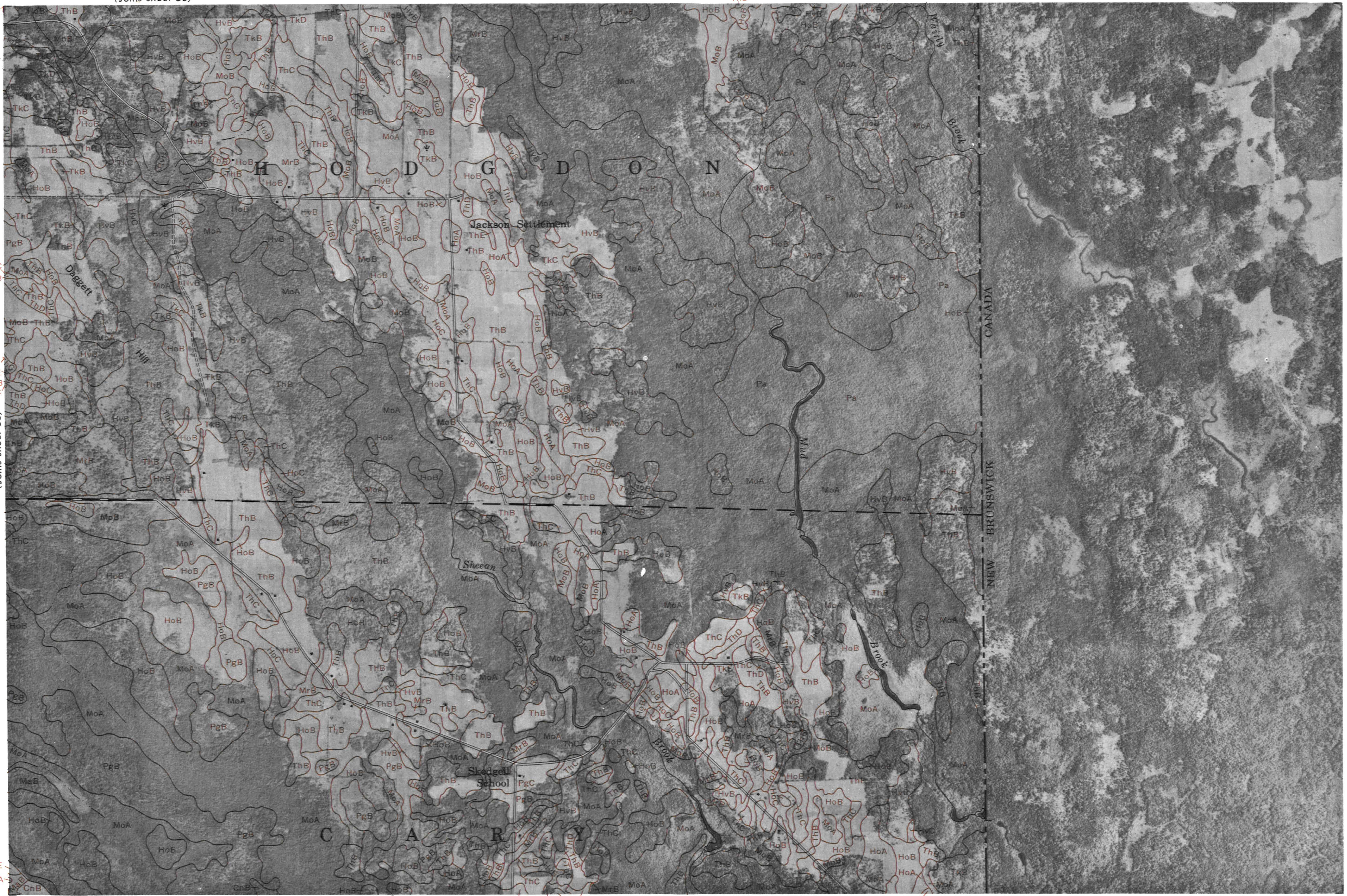


(Joins sheet 73)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 60)

(Joins sheet 66)



(Joins sheet 74)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

(Joins sheet 61)

(Joins sheet 69)

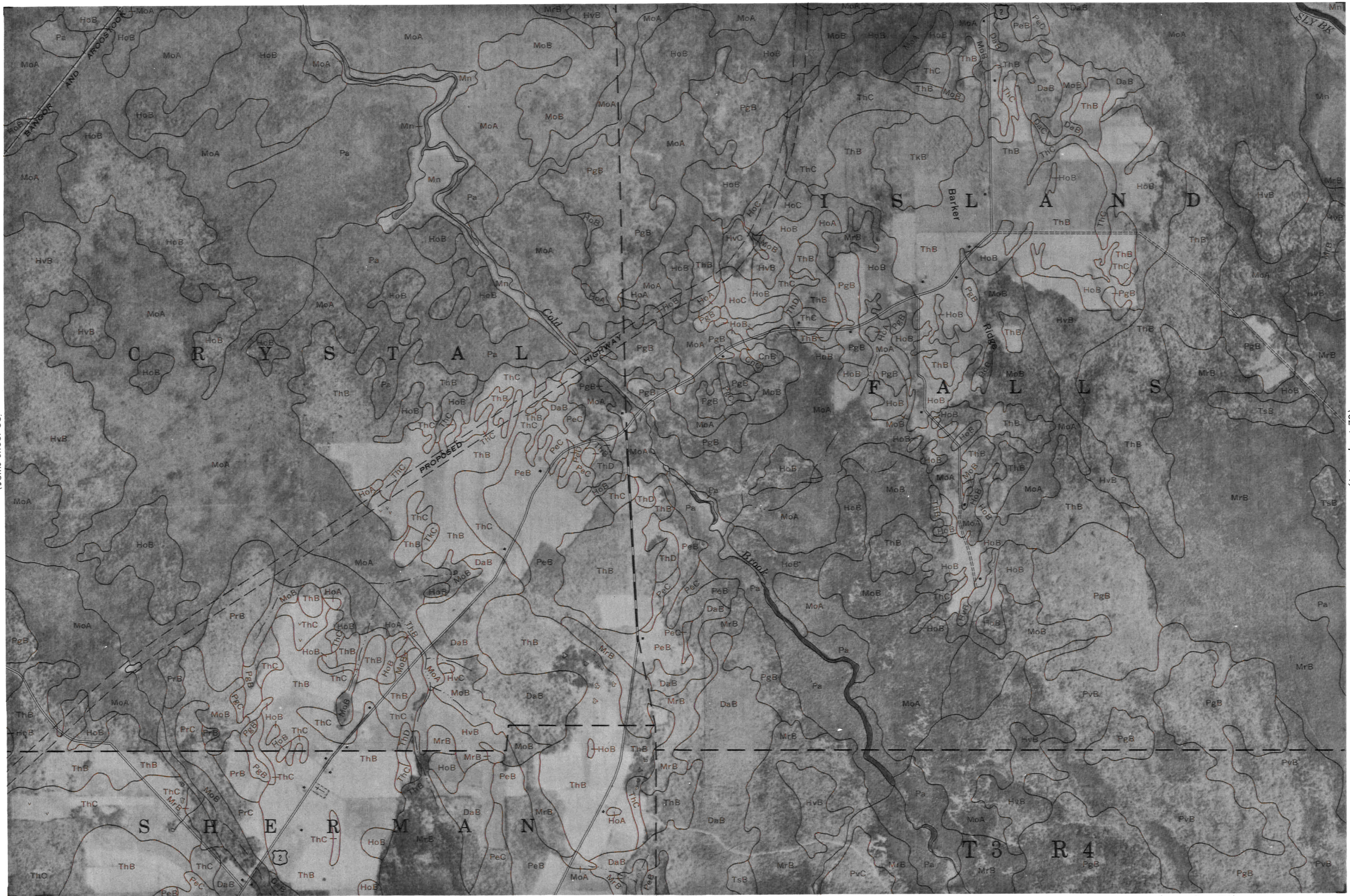
(Joins sheet 75)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

DaB ThB

(Joins sheet 62)

(Joins sheet 68)



(Joins sheet 70)

(Joins sheet 76)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

(Joins sheet 63)

(Joins sheet 69)

(Joins sheet 71)

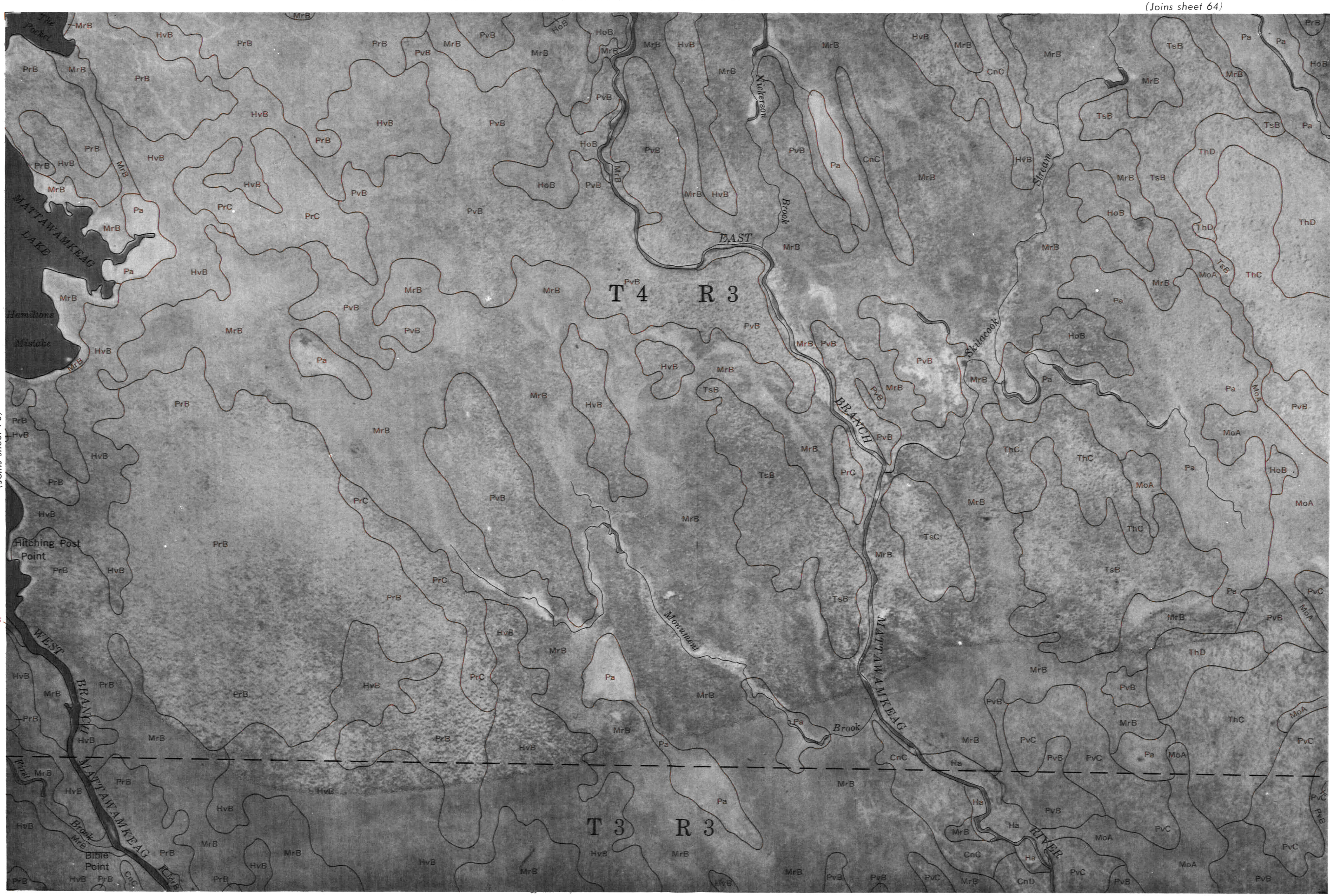
(Joins sheet 77)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 64)

(Joins sheet 70)

(Joins sheet 72)



(Joins sheet 78)

Scale 1:20000

0 ½ 1 Mile

0 5000 Feet

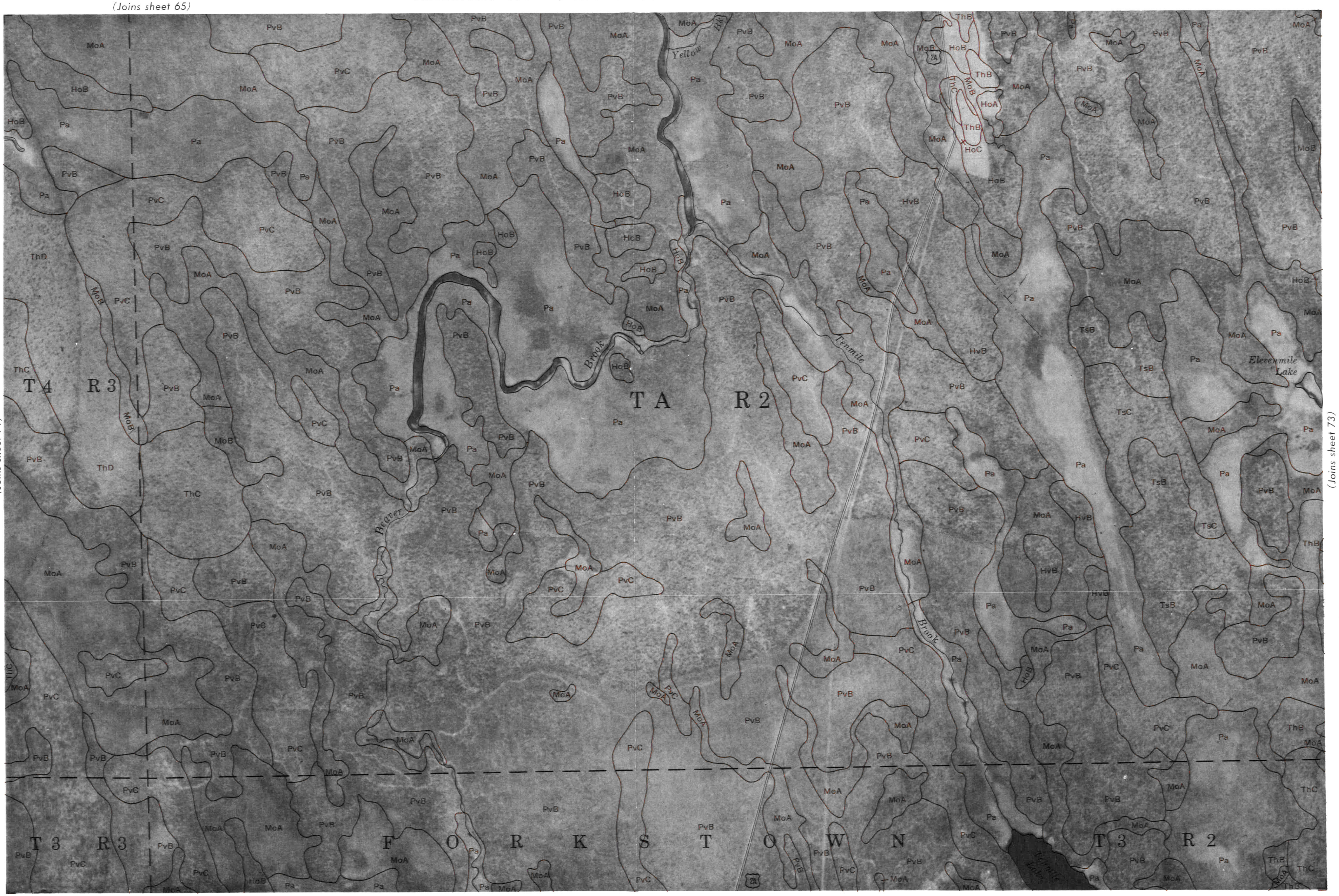
This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

72

(Joins sheet 65)

N

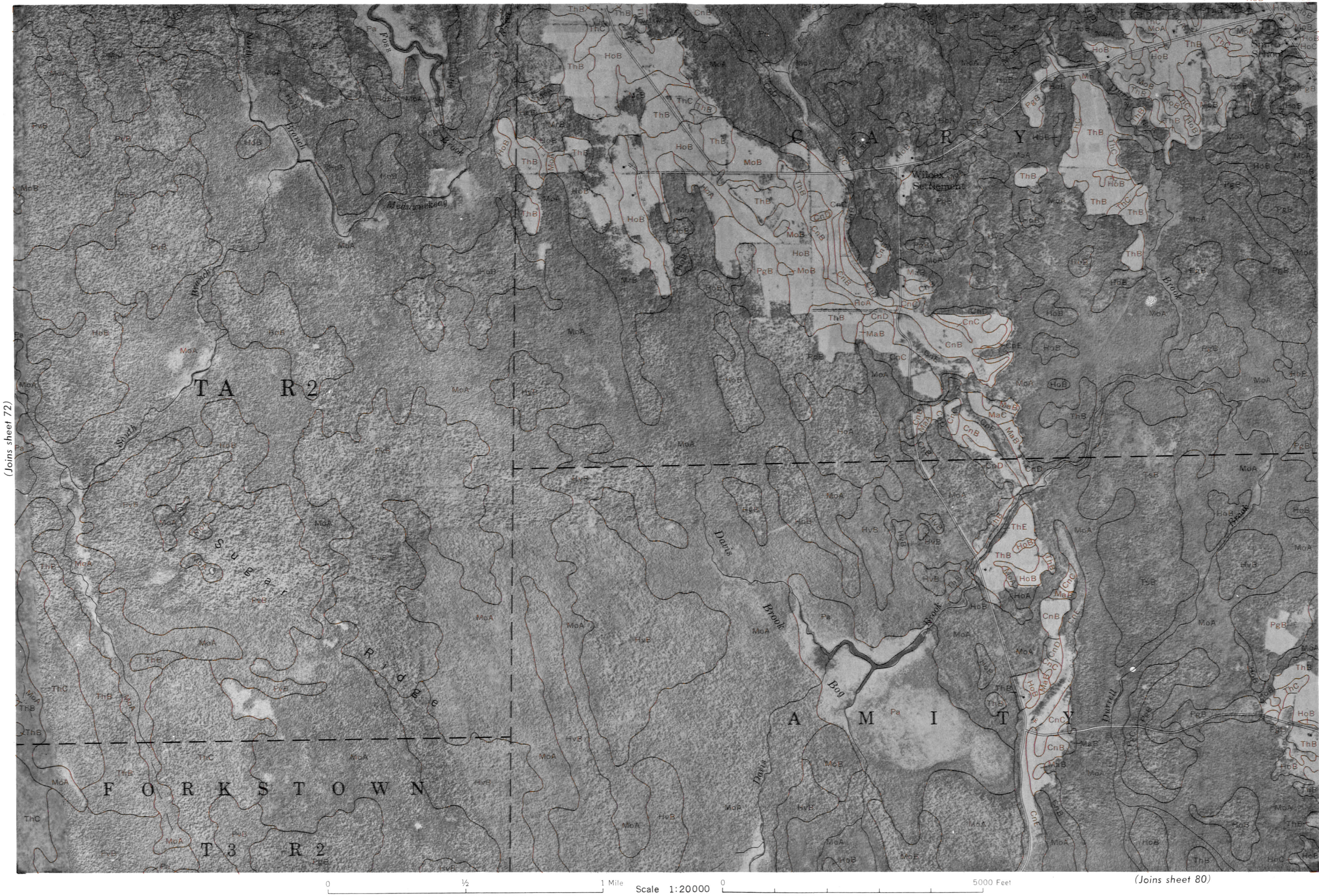
(Joins sheet 71)



(Joins sheet 73)

(Joins sheet 79)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

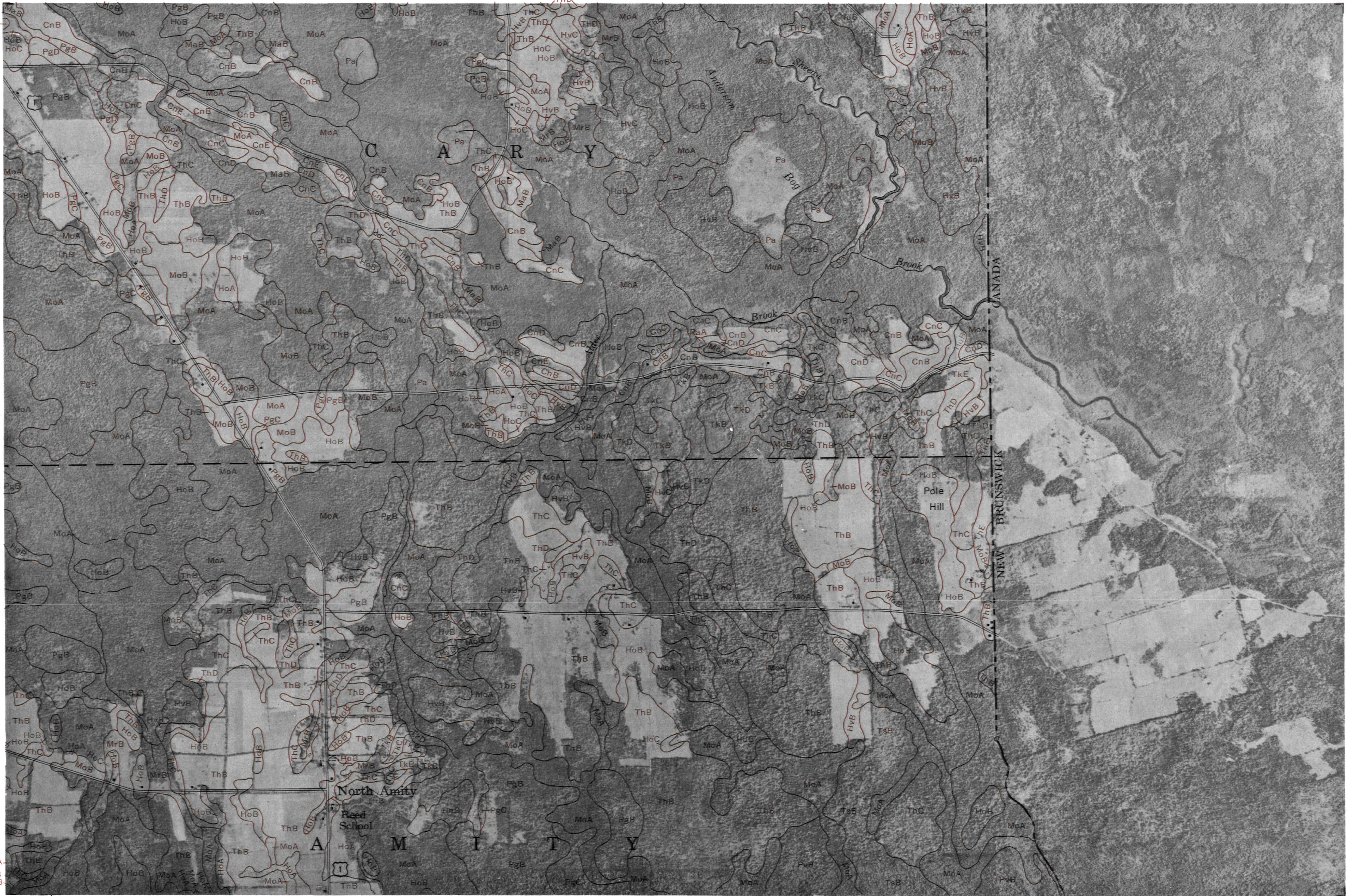


This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

(74)

(Joins sheet 67)

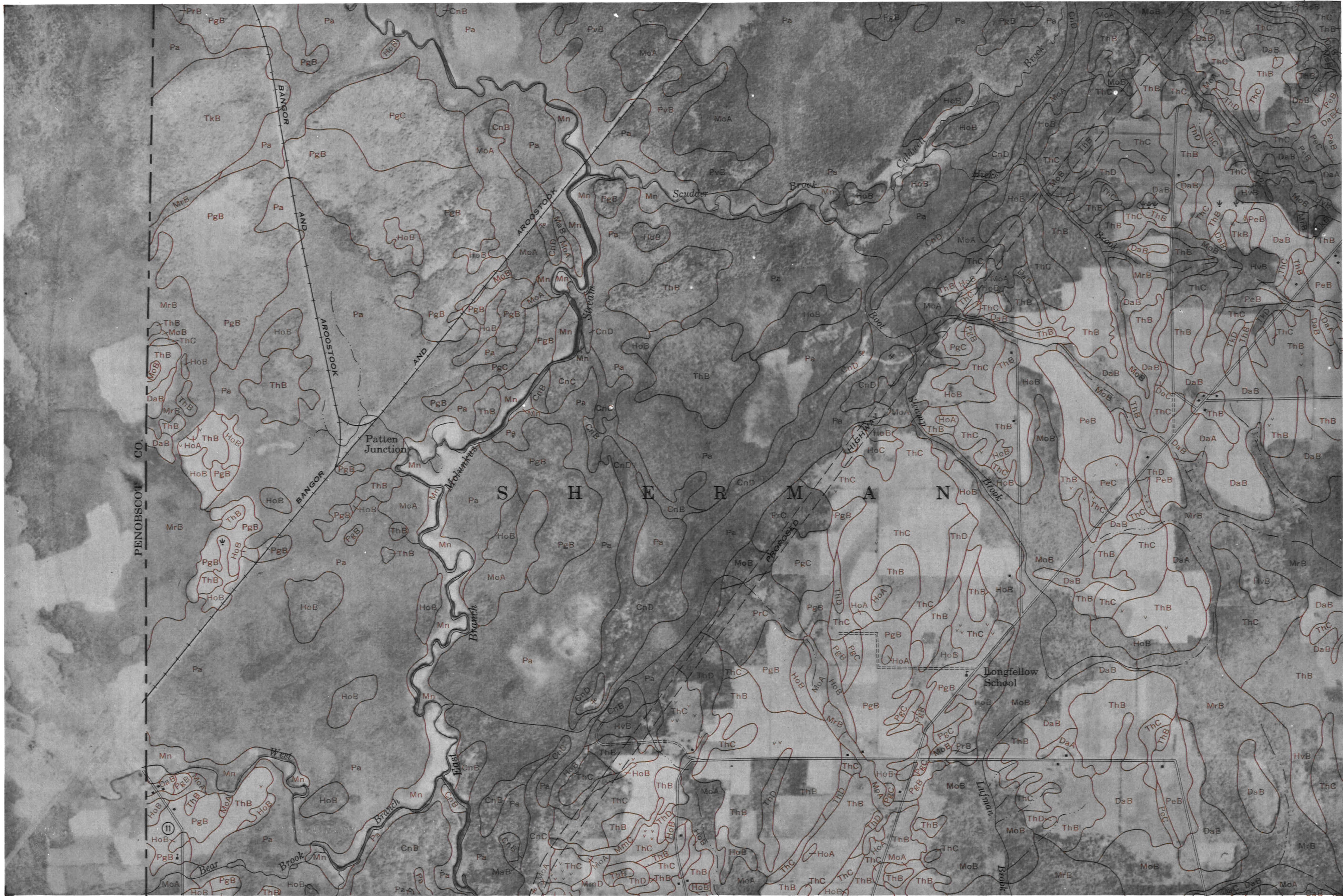
(Joins sheet 73)



(Sheet 80) (Joins sheet 81)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 68) | (69)



(Joins sheet 76)

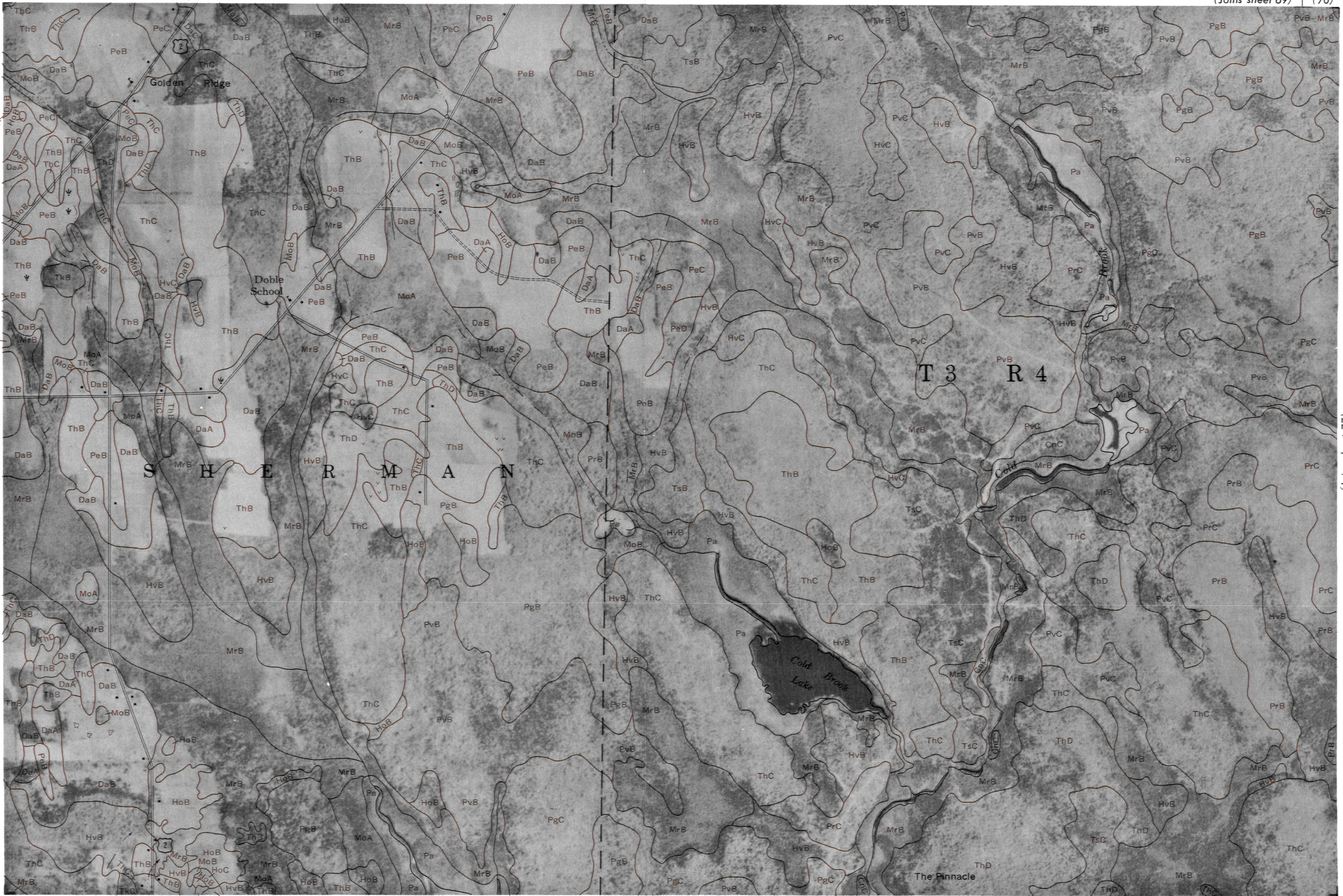
(Joins sheet 82)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

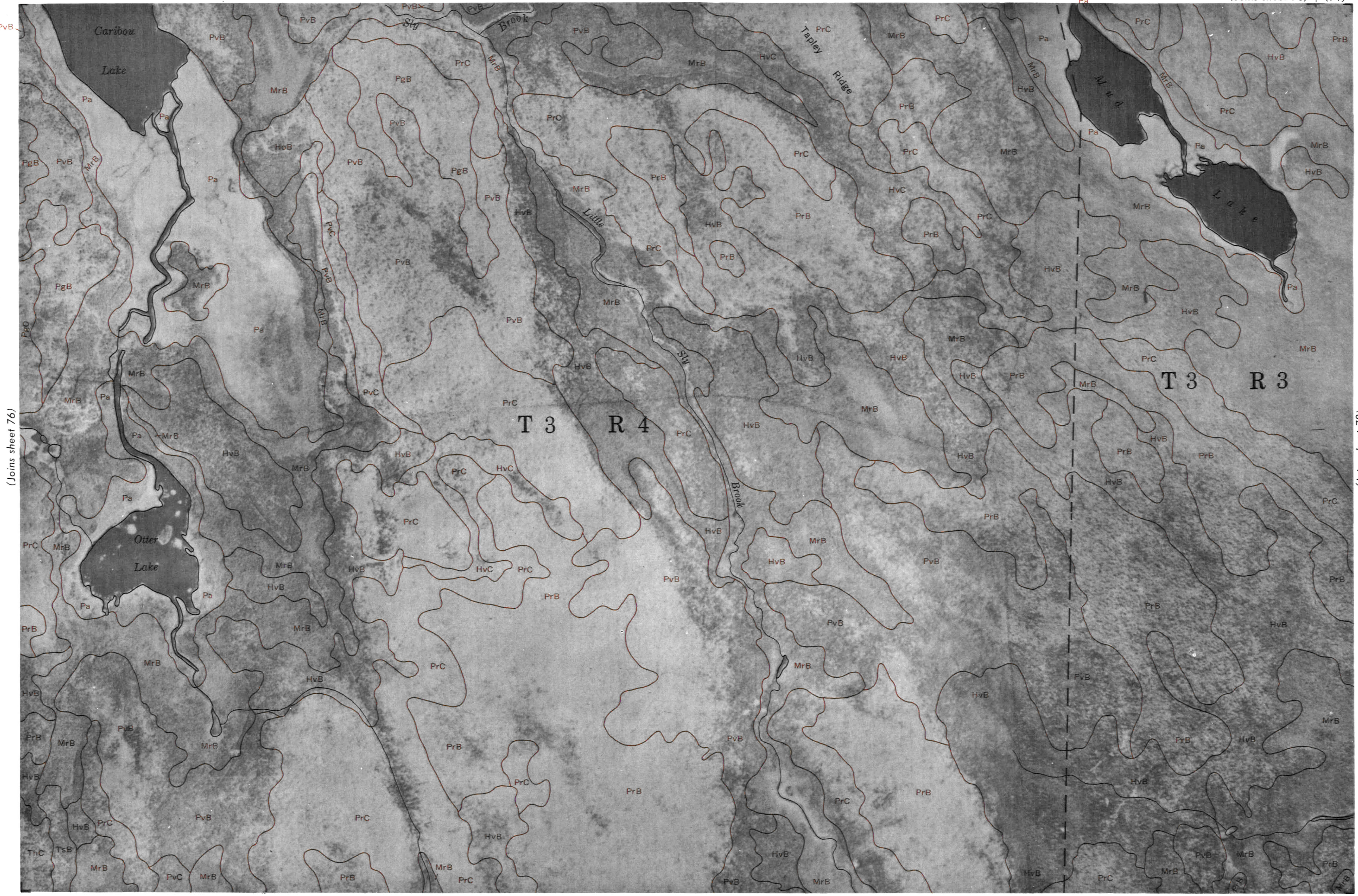
(Joins sheet 69)

(Joins sheet 69) | (70)



(Joins sheet 83)

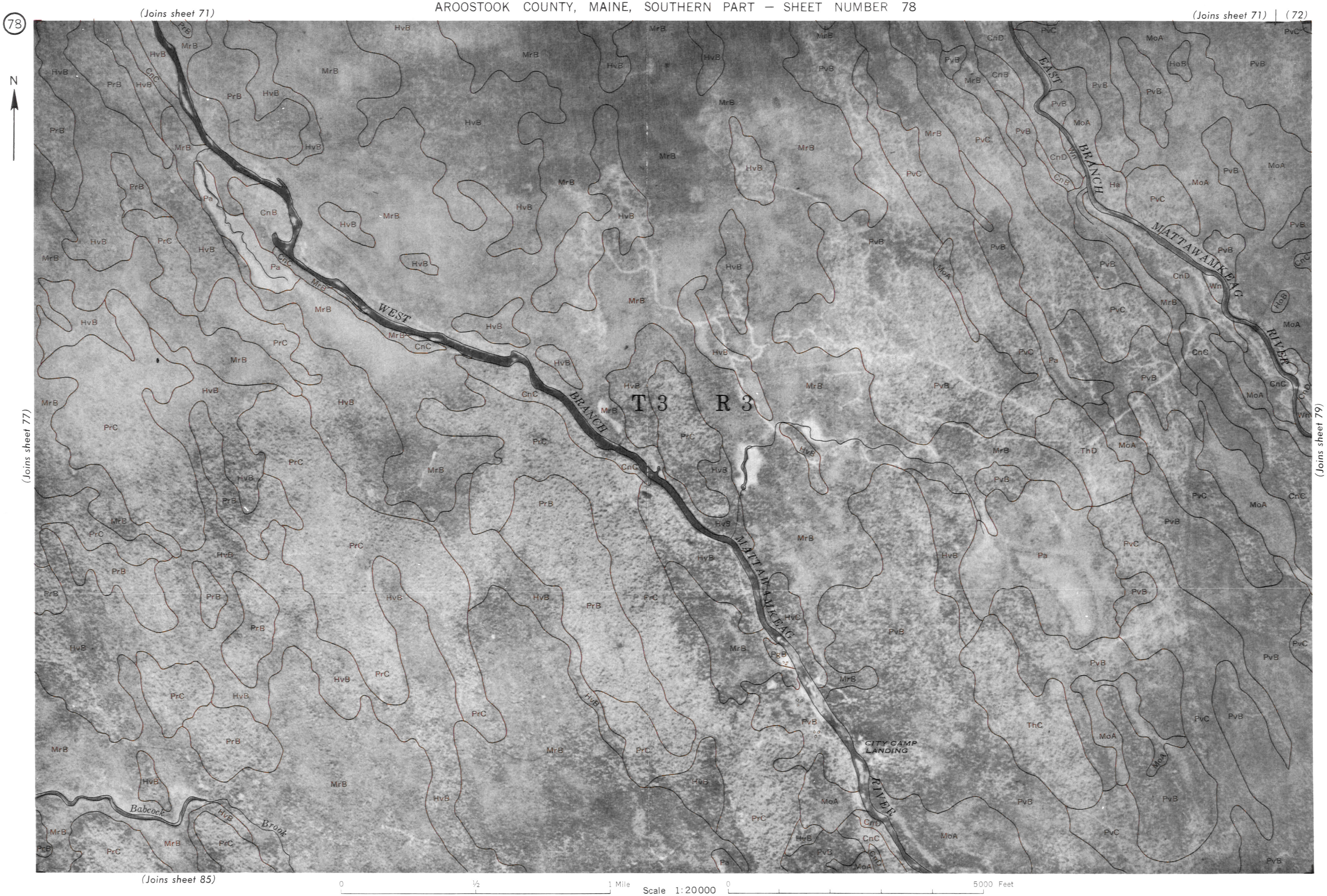
0 ½ 1 Mile Scale 1:20000 0 5000 Feet



(Joins sheet 84)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.


(Joins sheet 71)
(Joins sheet 71) | (72)
N
(Joins sheet 77)
(Joins sheet 79)
(Joins sheet 85)
WEST BRANCH MATTAWAMKEAG RIVER
EAST BRANCH MATTAWAMKEAG RIVER
T 3 R 3
CITY CAMP LANDING
Babcock Brook
0 ½ 1 Mile
Scale 1:20000
0 5000 Feet

(Joins sheet 72) | (73)

(Joins sheet 78)

(Joins sheet 80)

(Joins sheet 86)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

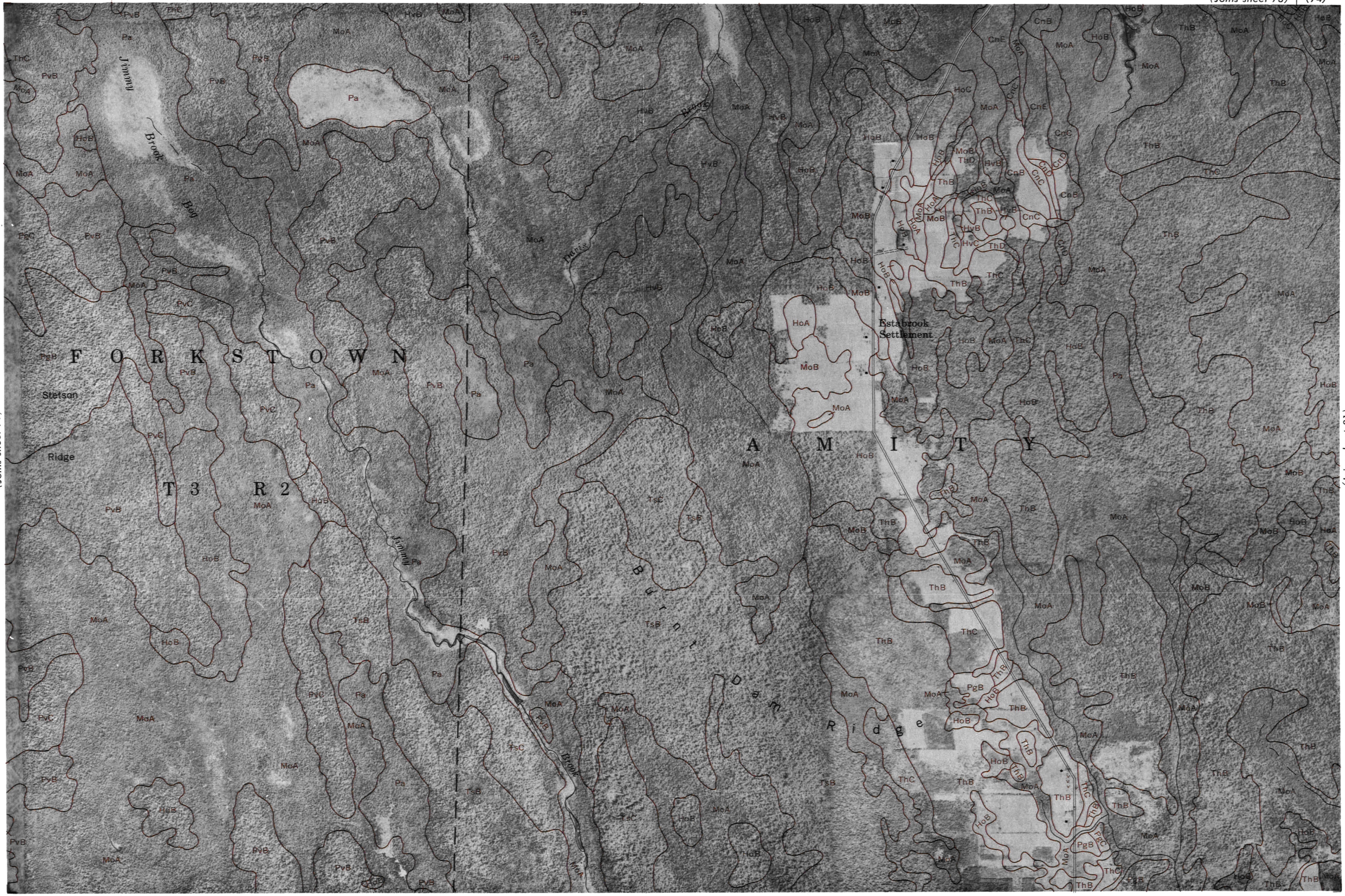
This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

(Joins sheet 73)

(Joins sheet 73) | (74)

N

(Joins sheet 79)



(Joins sheet 81)

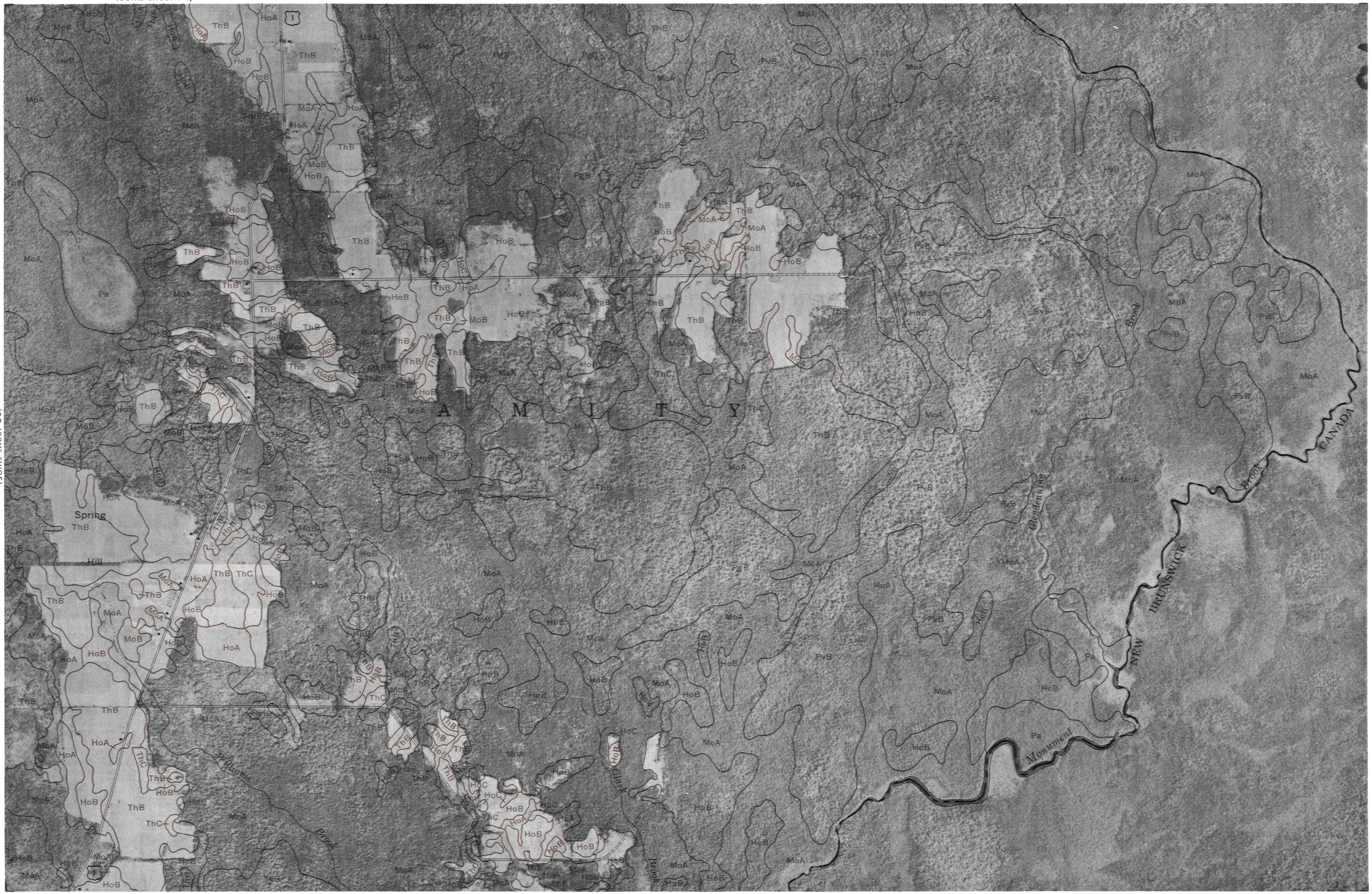
(Joins sheet 87)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

81

(Joins sheet 74)

(Joins sheet 80)



(Joins sheet 88)

0 ½ 1 Mile
Scale 1:20000
0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

(Joins sheet 75)

N

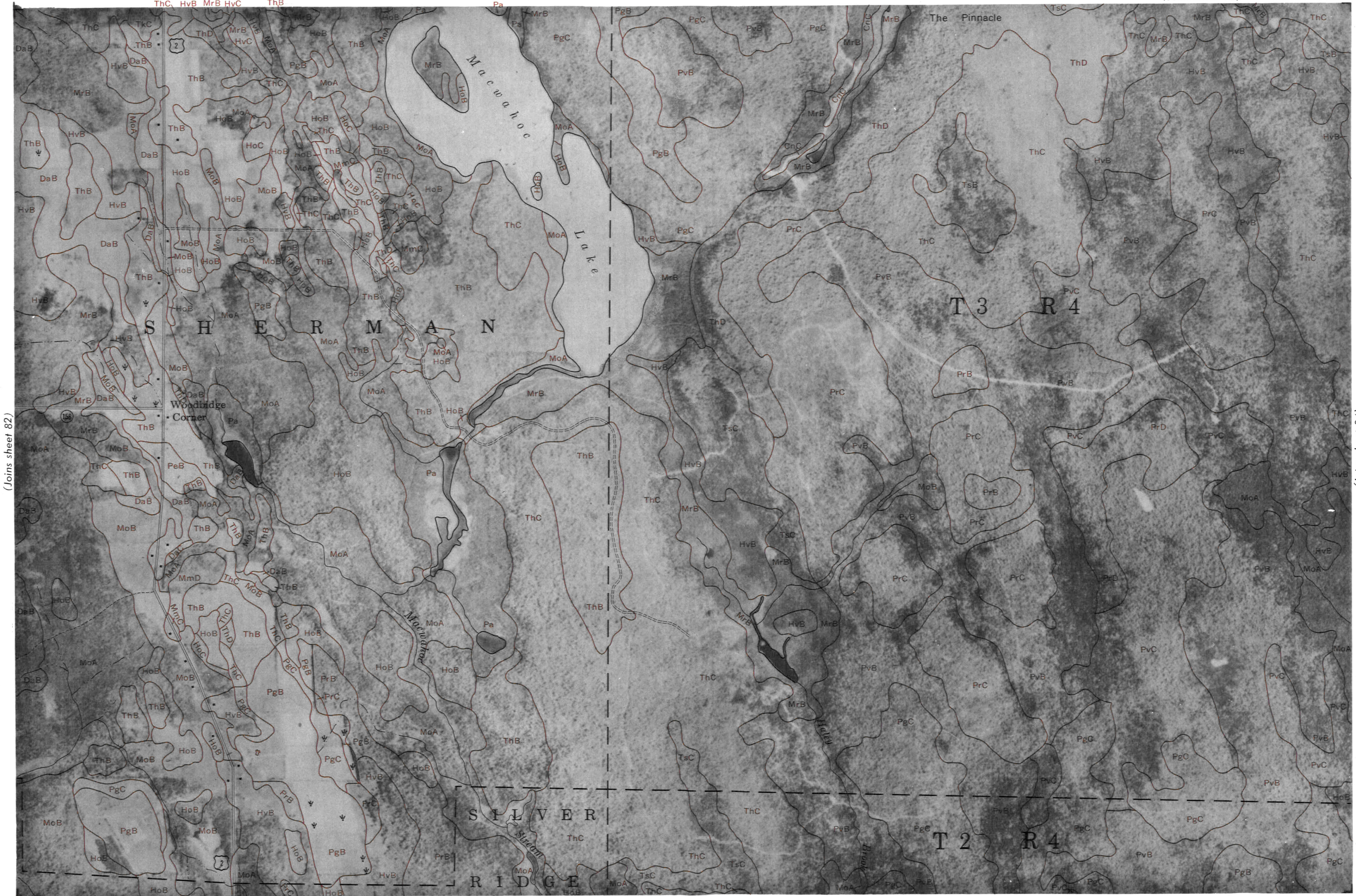
(Joins sheet 83)

(Joins sheet 89)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(Joins sheet 76)

(Joins sheet 82)



(Joins sheet 84)

(Joins sheet 90)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

(Joins sheet 77)

(Joins sheet 83)

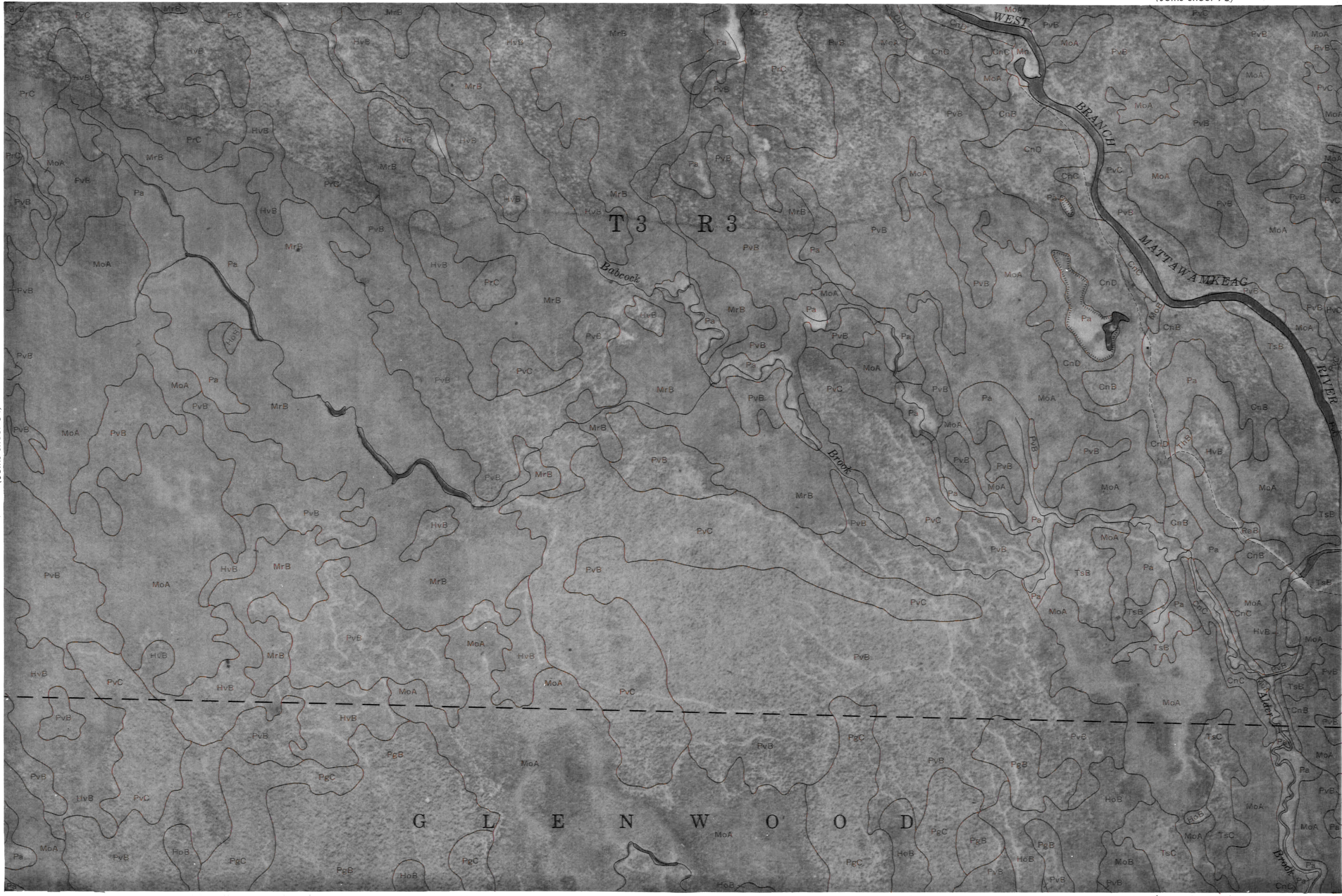
(Joins sheet 85)

(Joins sheet 91)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 78)

85



(Joins sheet 84)

(Joins sheet 86)

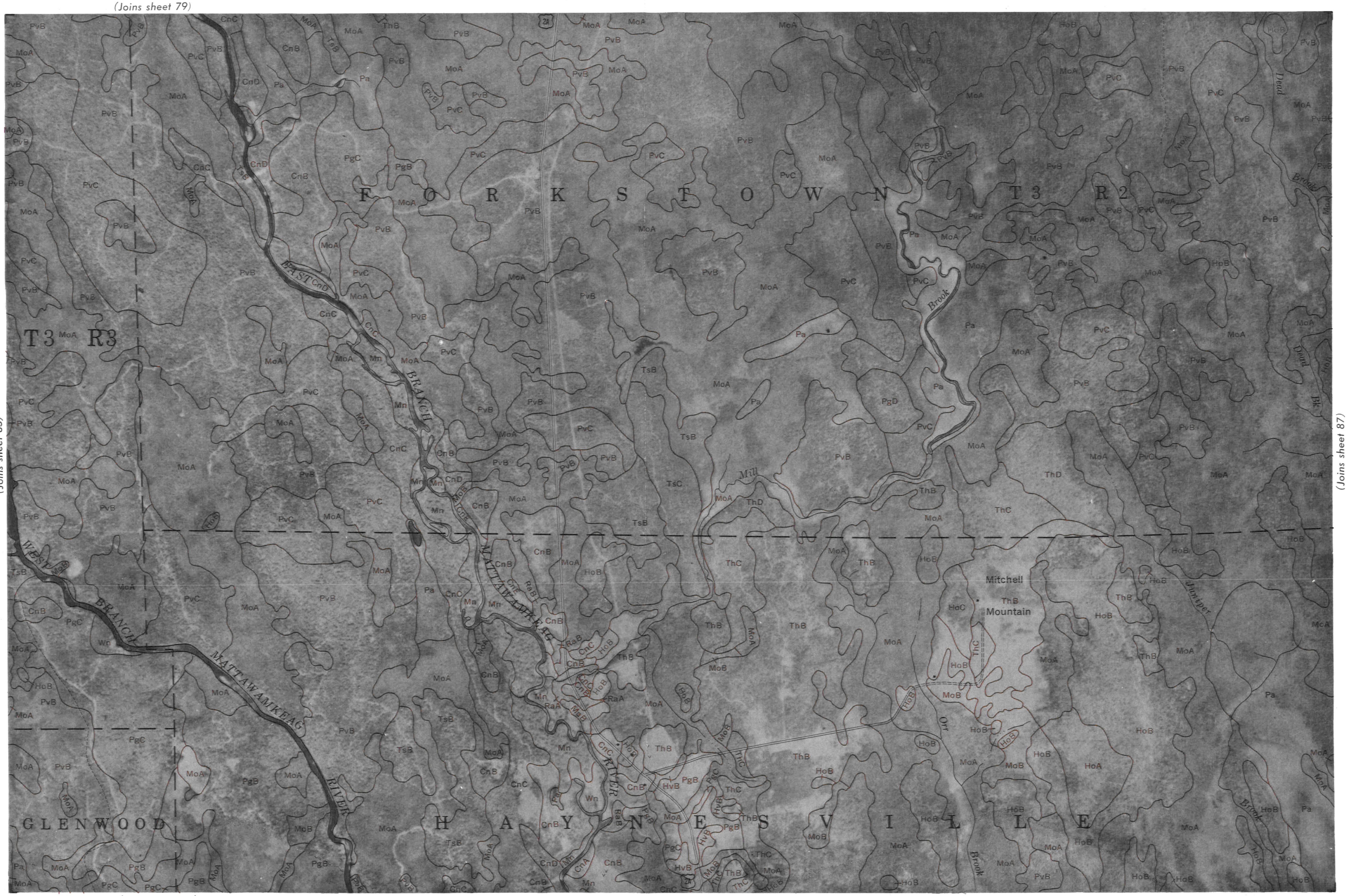
(Joins sheet 92)

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

86

(Joins sheet 79)

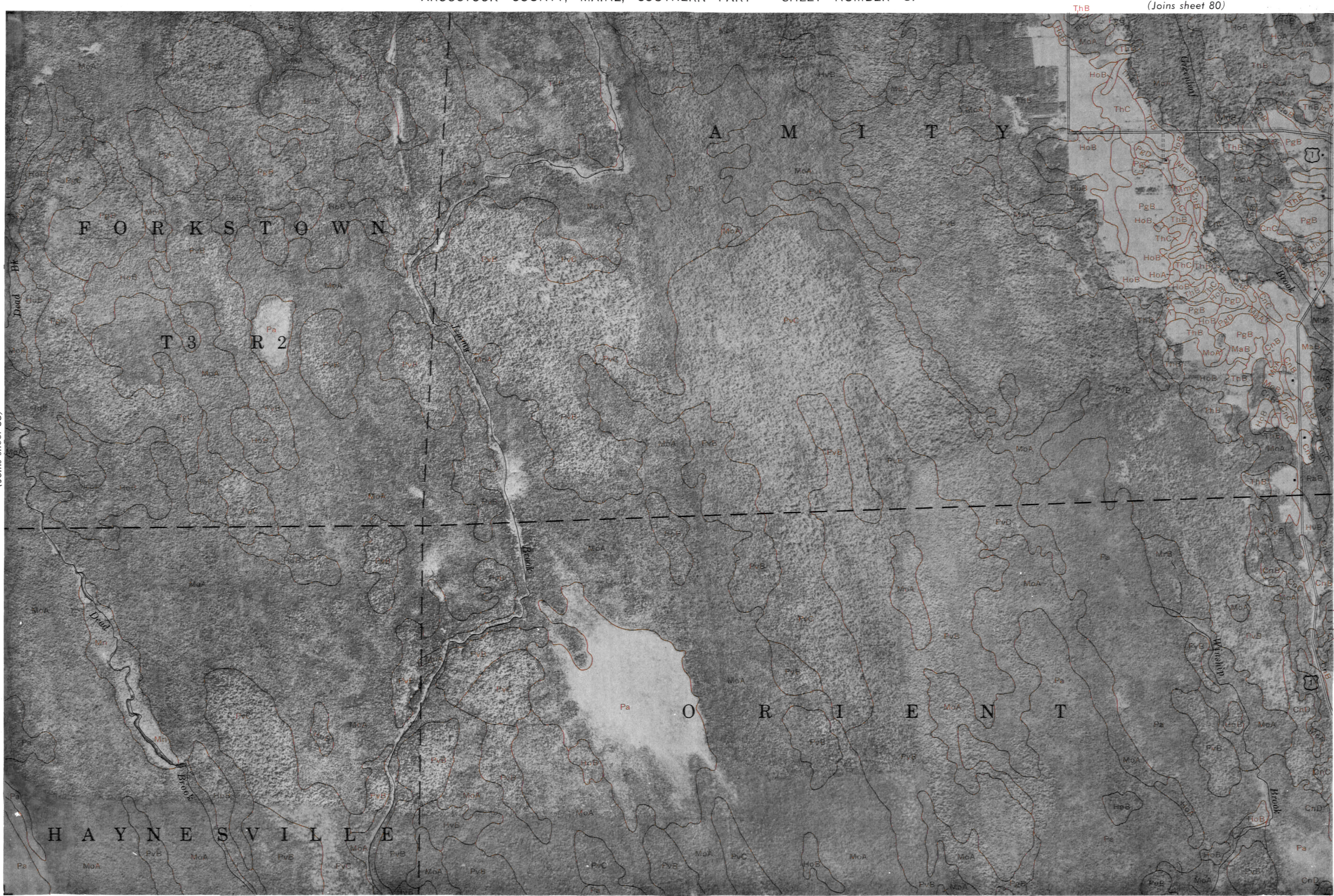


(Joins sheet 85)

(Joins sheet 87)

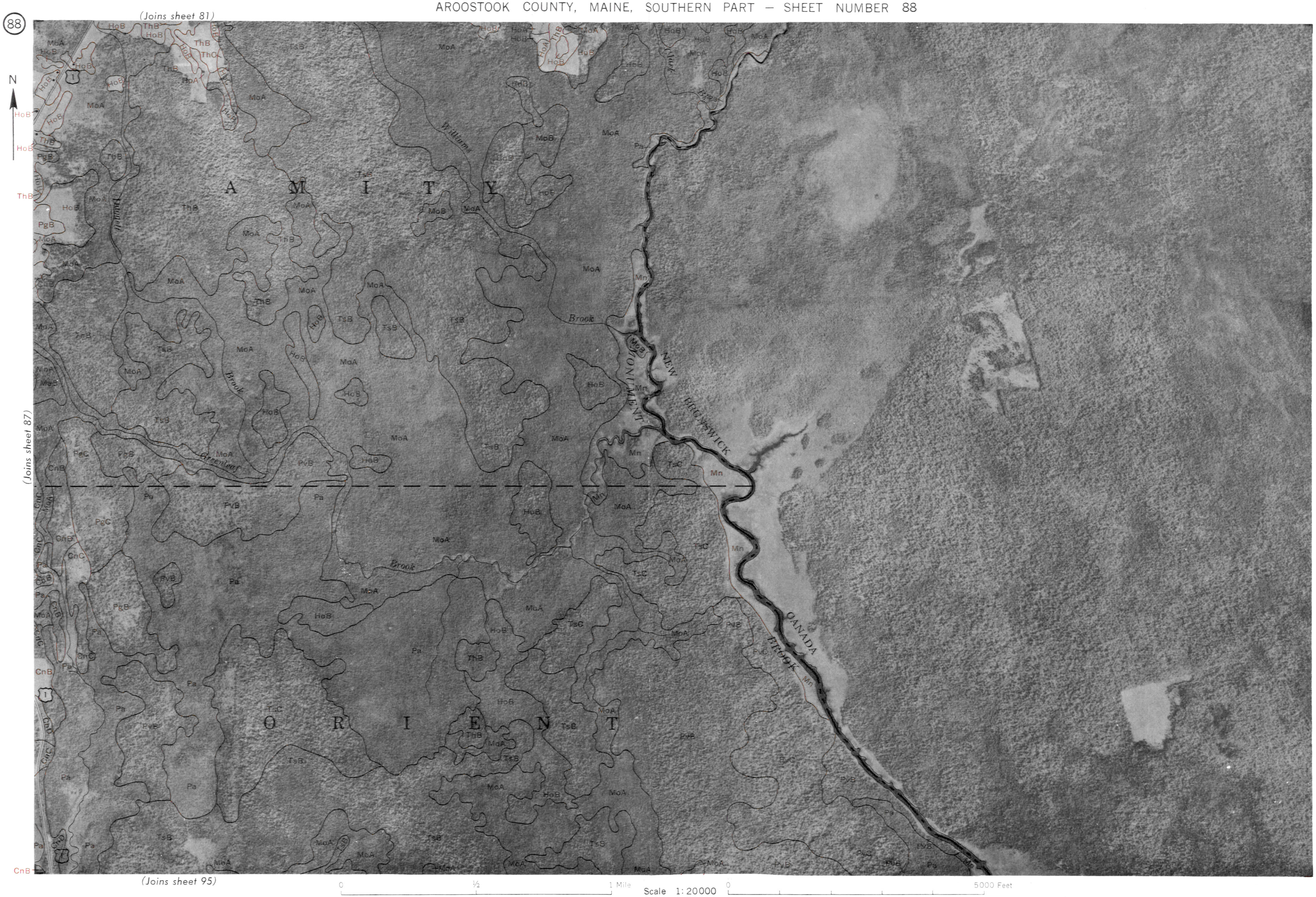
(Joins sheet 93)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet



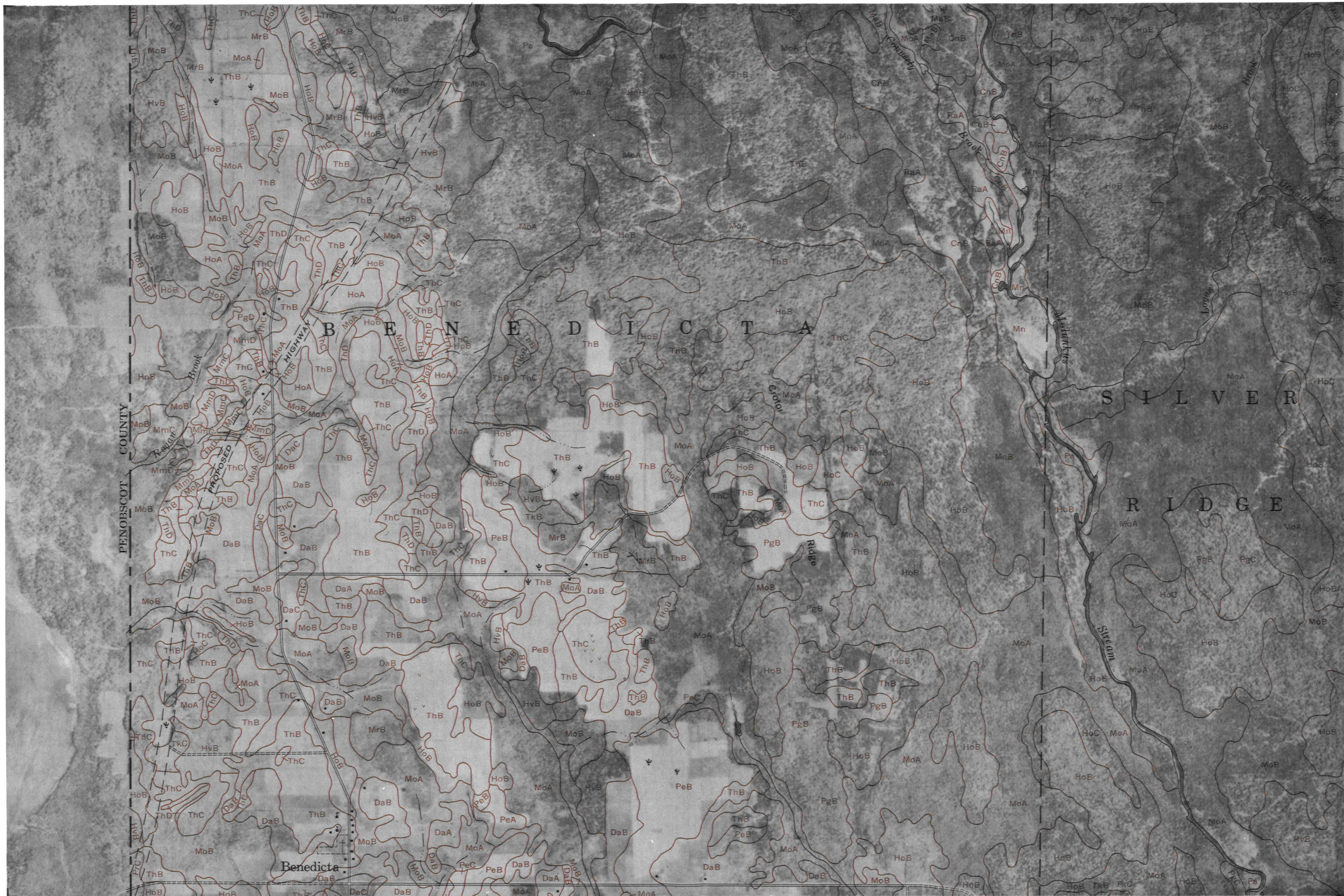
0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.


88
(Joins sheet 81)
(Joins sheet 87)
(Joins sheet 95)
N
A M I T Y
O R I E N T
NEW BRUNSWICK
MONUMENT
CANADA BROOK
Williams
Brook
Greenleaf
Scale 1:20000
0
½
1 Mile
0
5000 Feet

(Joins sheet 82)

89



(Joins sheet 90)

ThC MoB MoB DaB DaB MoA

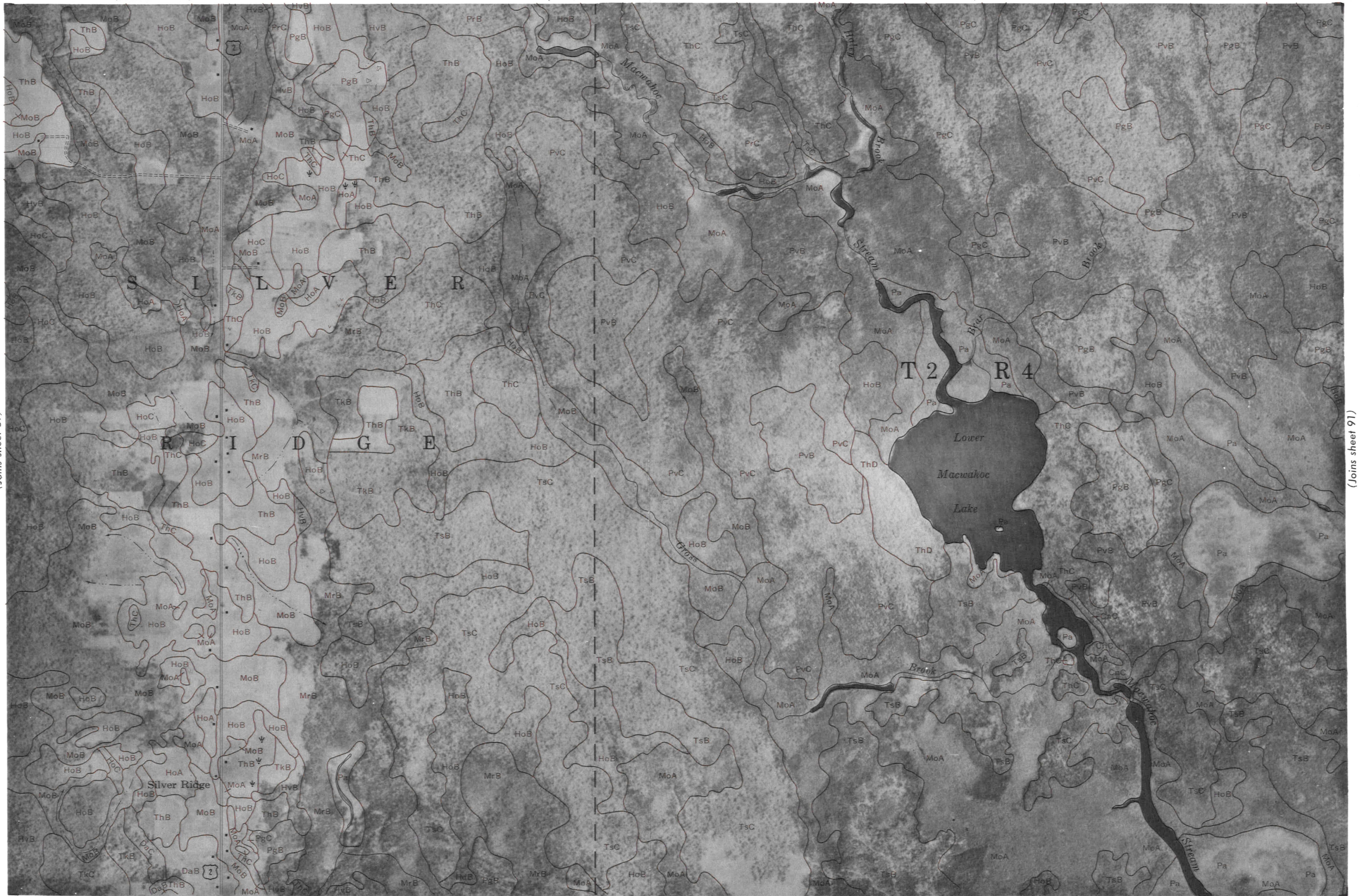
0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 96)

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

(Joins sheet 83)

(Joins sheet 89)



(Joins sheet 91)

(Joins sheet 97)

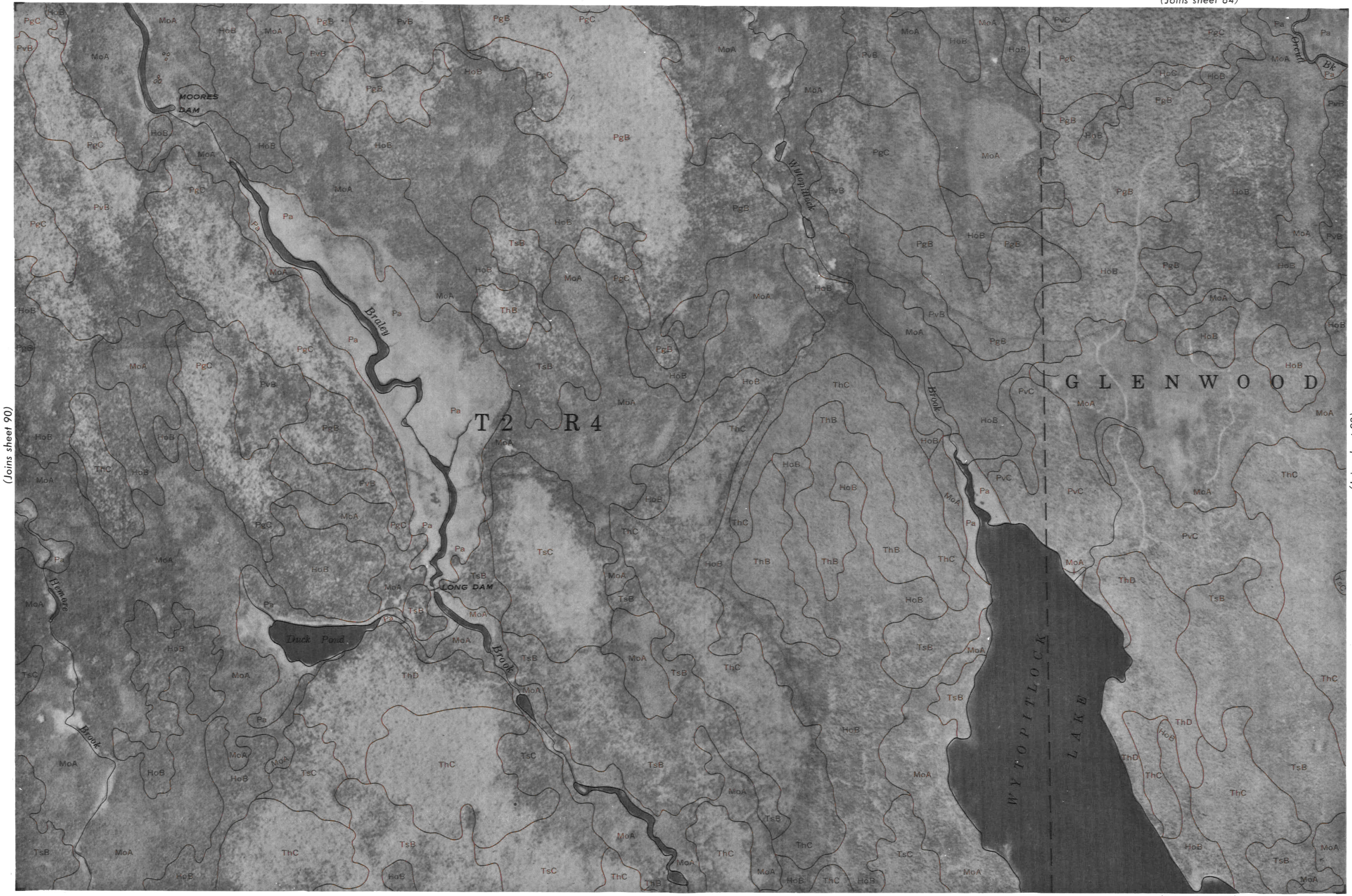
0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 84)

(Joins sheet 90)



(Joins sheet 92)

(Joins sheet 98)

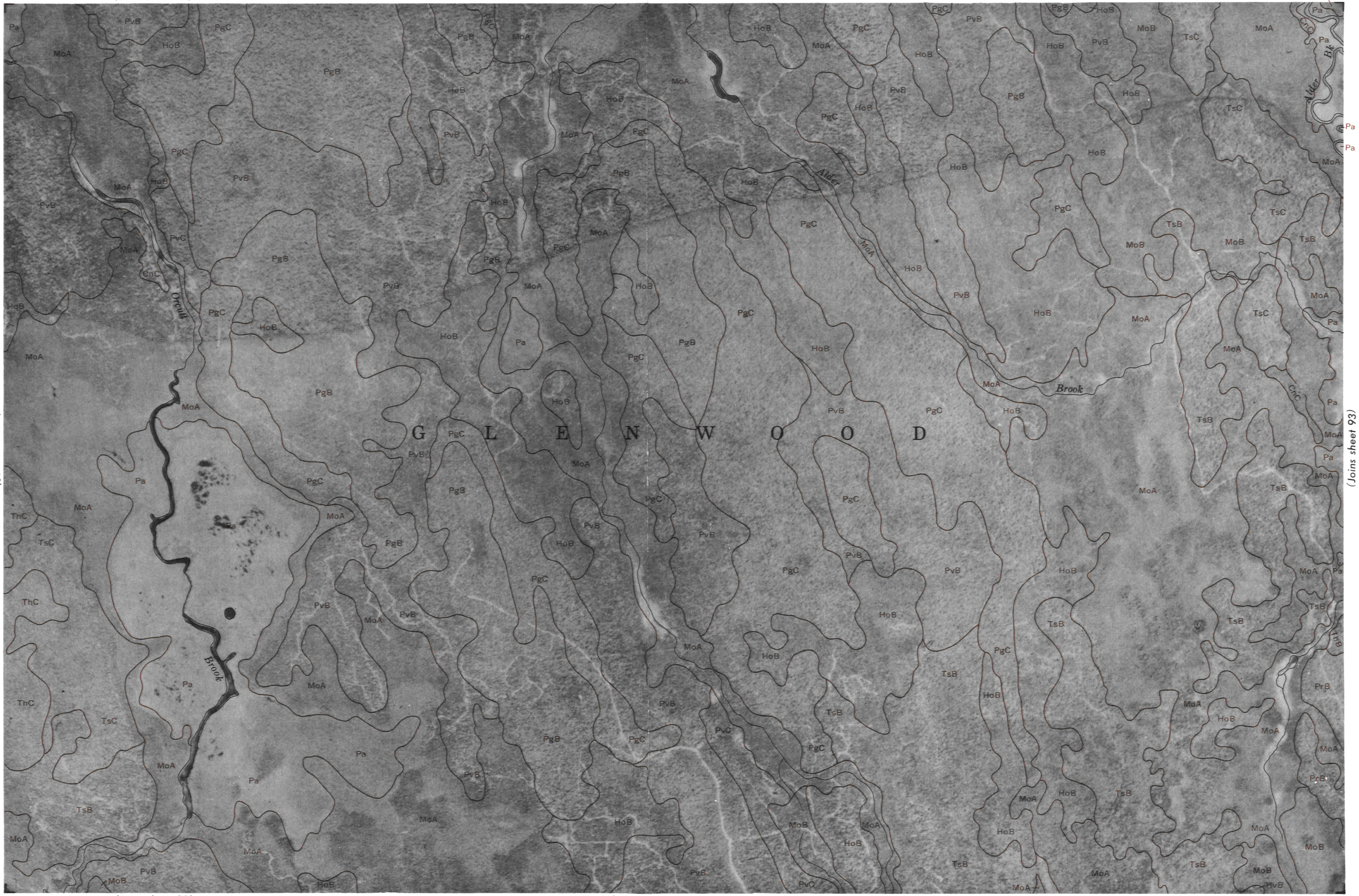
0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

AROOSTOOK COUNTY, MAINE, SOUTHERN PART — SHEET NUMBER 92

(Joins sheet 85)

(Joins sheet 91)



(Joins sheet 93)

(Joins sheet 99)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 86)

(Joins sheet 92)

(Joins sheet 94)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

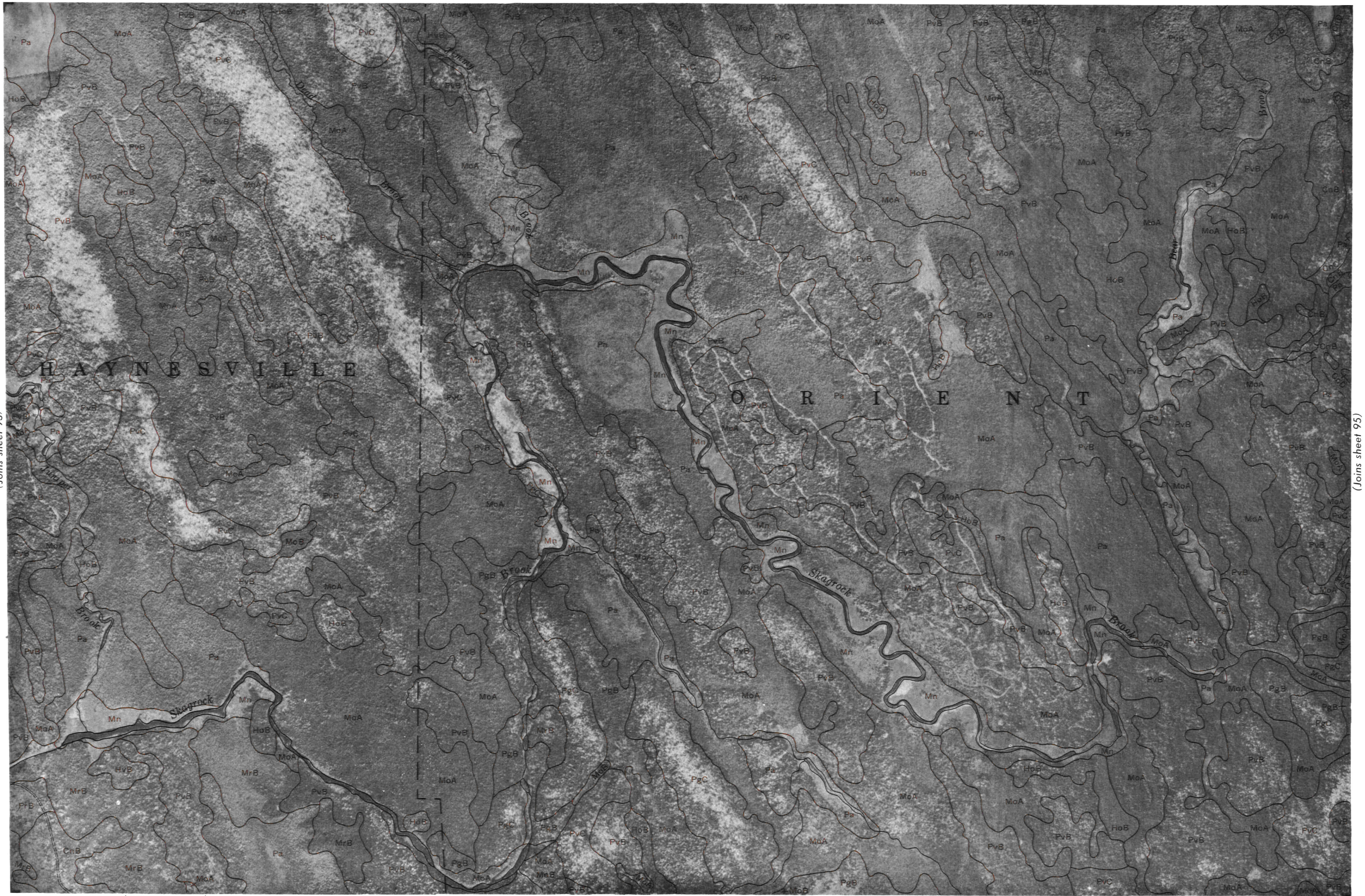
(Joins sheet 100)

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

(Joins sheet 87)

N

(Joins sheet 93)



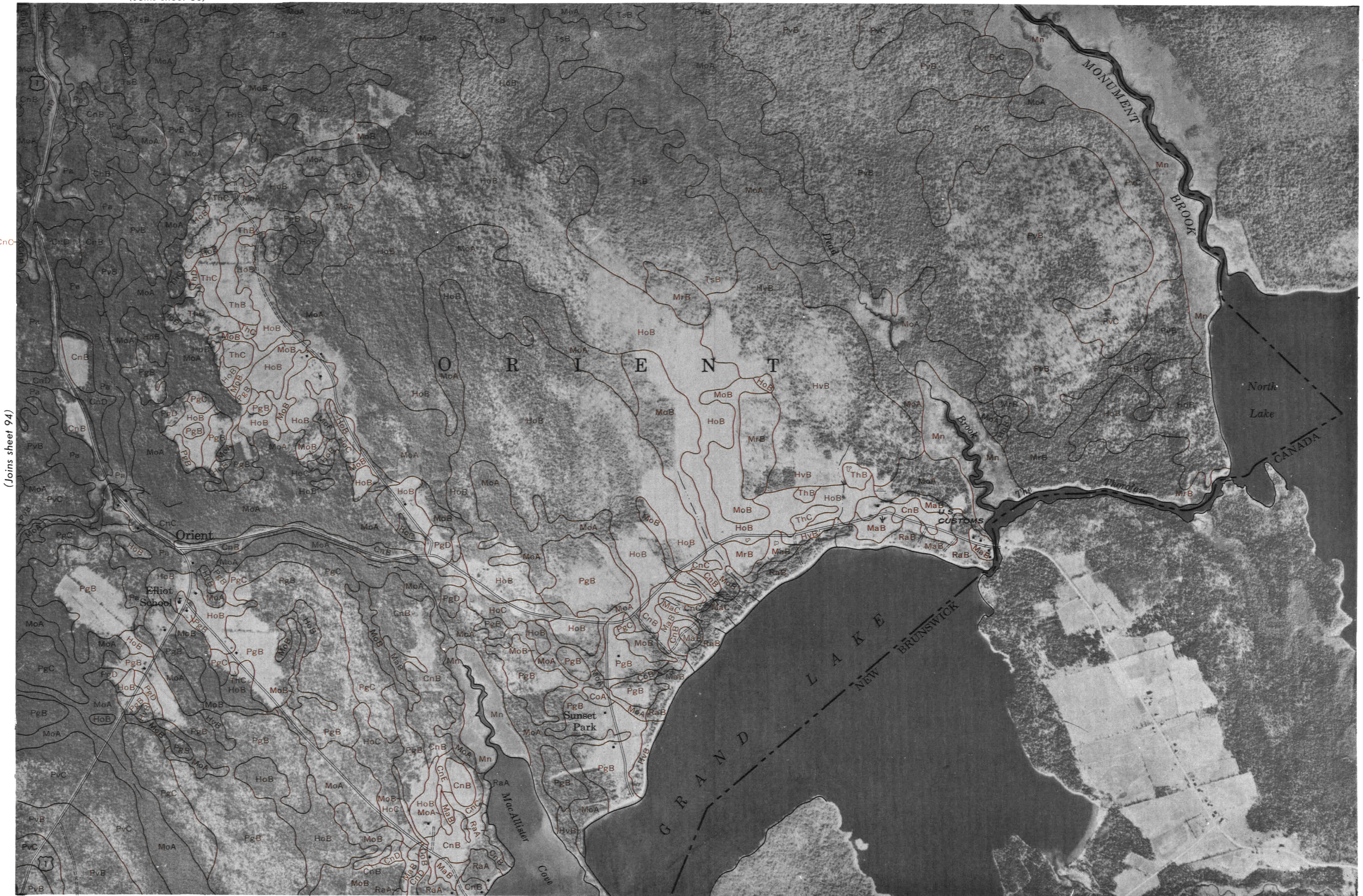
(Joins sheet 95)

(Joins sheet 101)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 88)

(Joins sheet 94)



(Joins sheet 102)

Scale 1: 20000

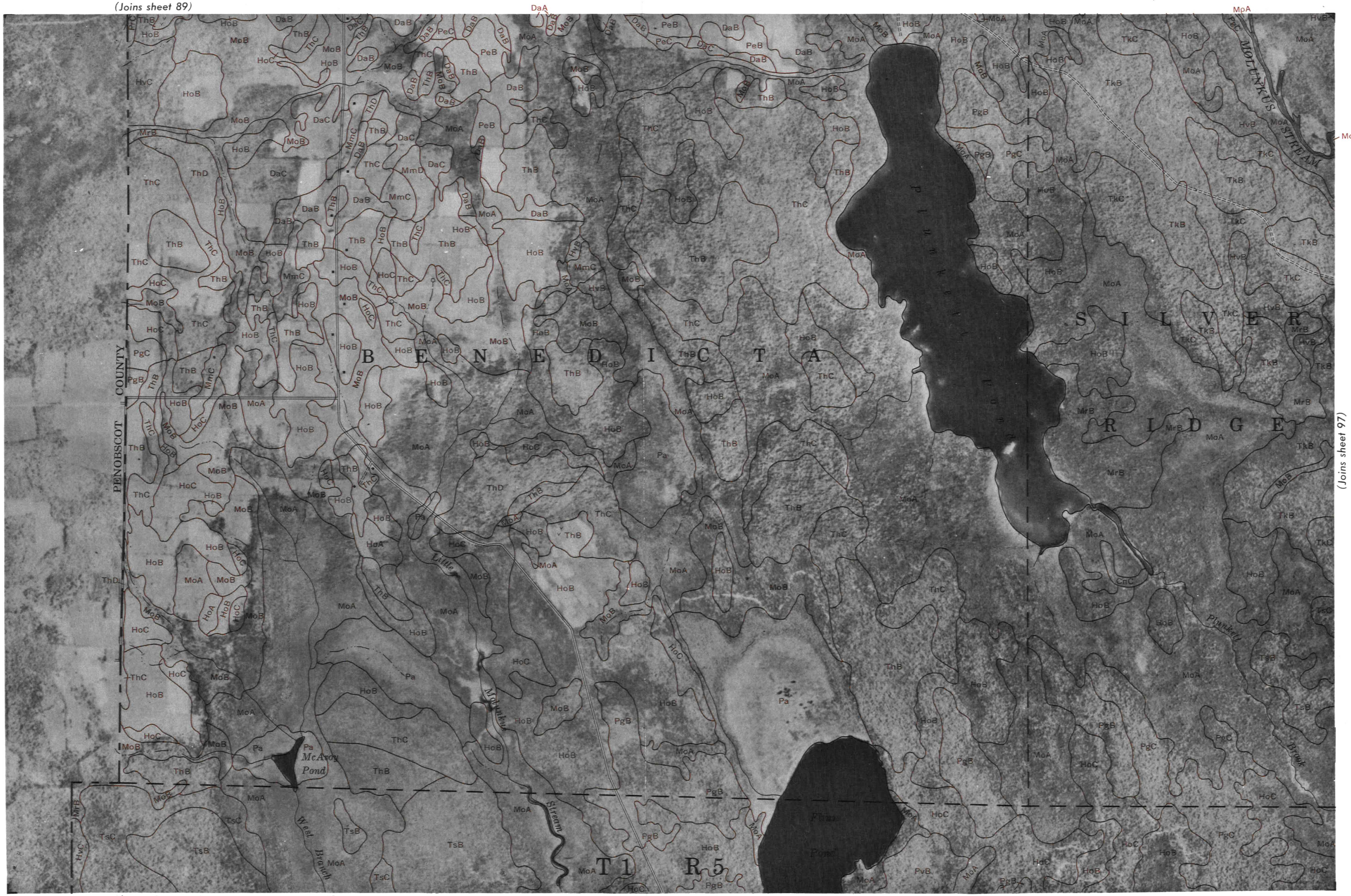
0 ½ 1 Mile

0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

N

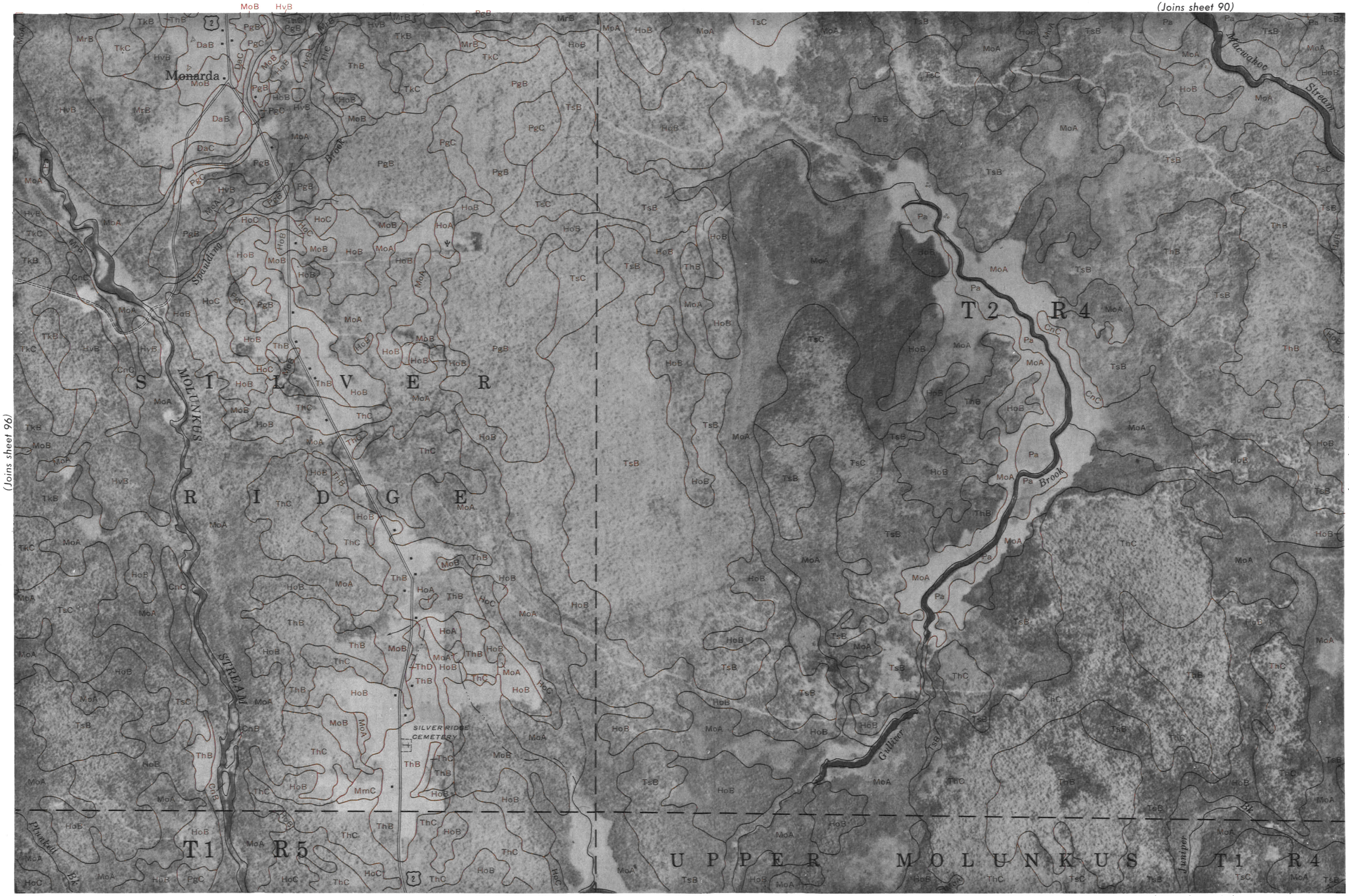
(Joins sheet 89)



(Joins sheet 103)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 90)



(Joins sheet 96)

(Joins sheet 98)

(Joins sheet 104)

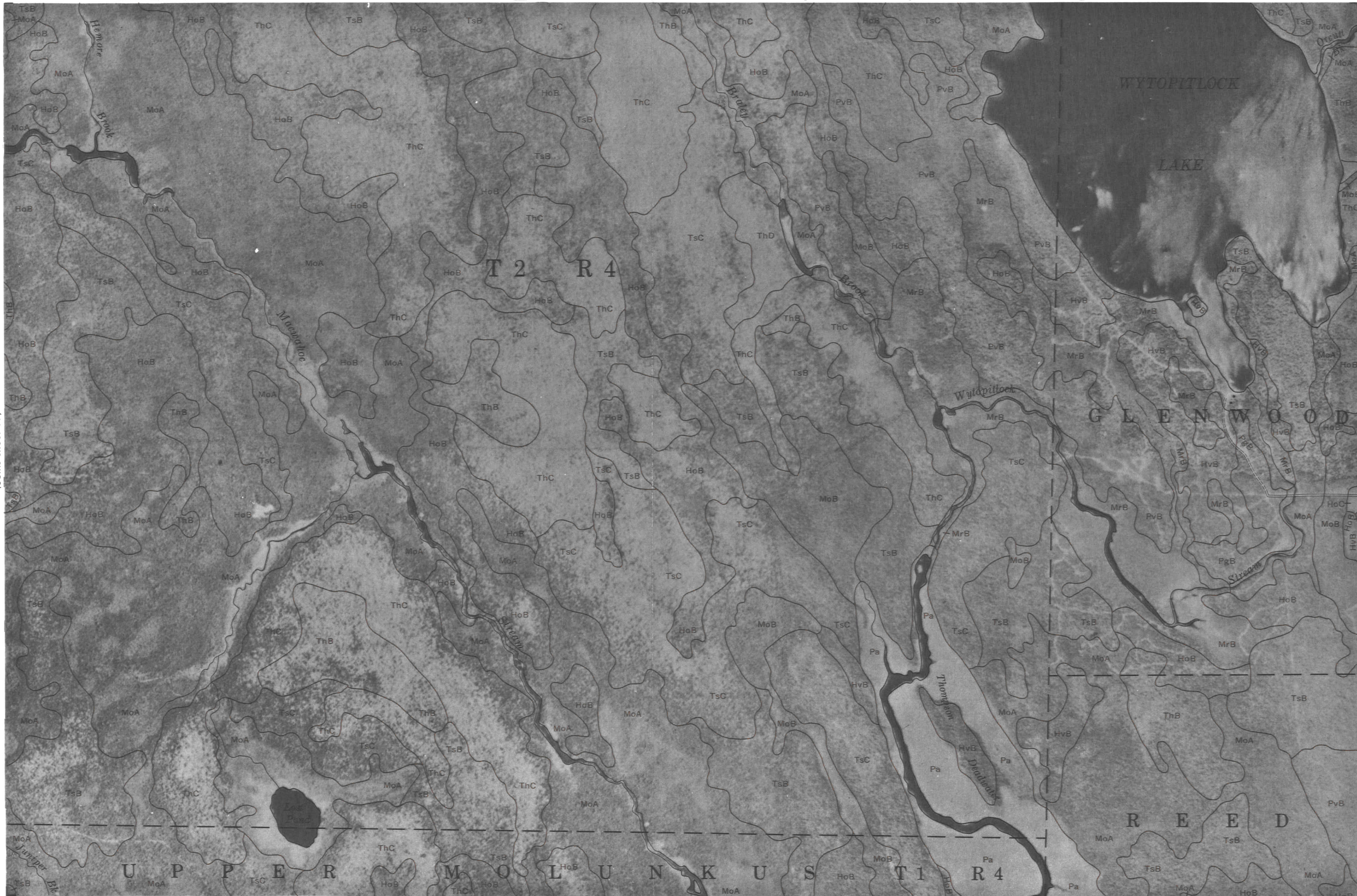
0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

(Joins sheet 91)

N

(Joins sheet 97)



(Joins sheet 99)

(Joins sheet 105)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(Joins sheet 92)

99

(Joins sheet 98)

(Joins sheet 100)

(Joins sheet 106)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

(Joins sheet 93)

(Joins sheet 99)

(Joins sheet 101)

(Joins sheet 107)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 94)

(Joins sheet 100)

(Joins sheet 102)

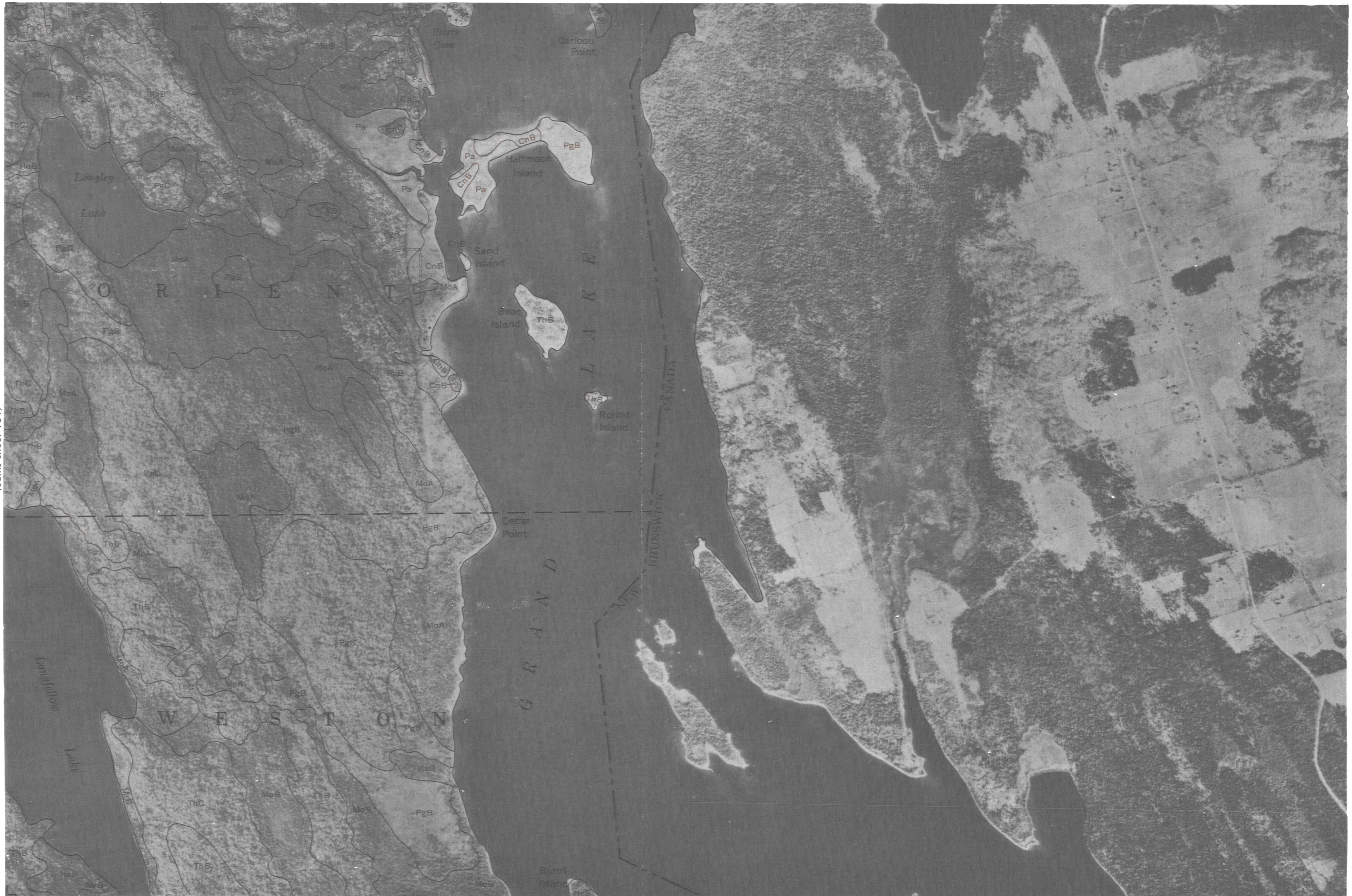
(Joins sheet 108)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

102

(Joins sheet 95)



(Joins sheet 109)

0 ½ 1 Mile Scale 1: 20000 0 5000 Feet

(Joins sheet 96)

N

(Joins sheet 104)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 110)

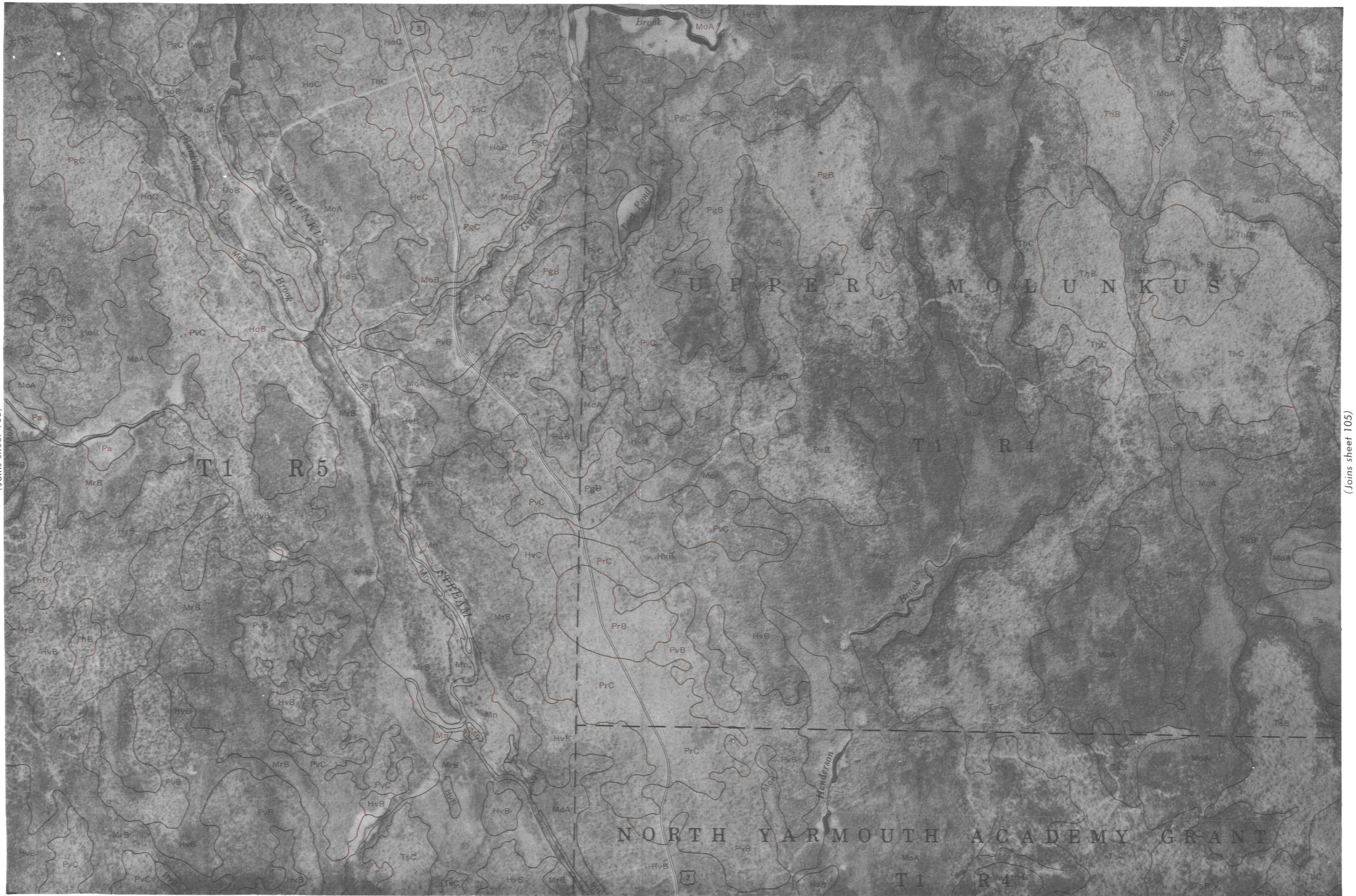
This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

(Joins sheet 97)

AROOSTOOK COUNTY, MAINE, SOUTHERN PART — SHEET NUMBER 104

N

(Joins sheet 103)



(Joins sheet 105)

(Joins sheet 111)

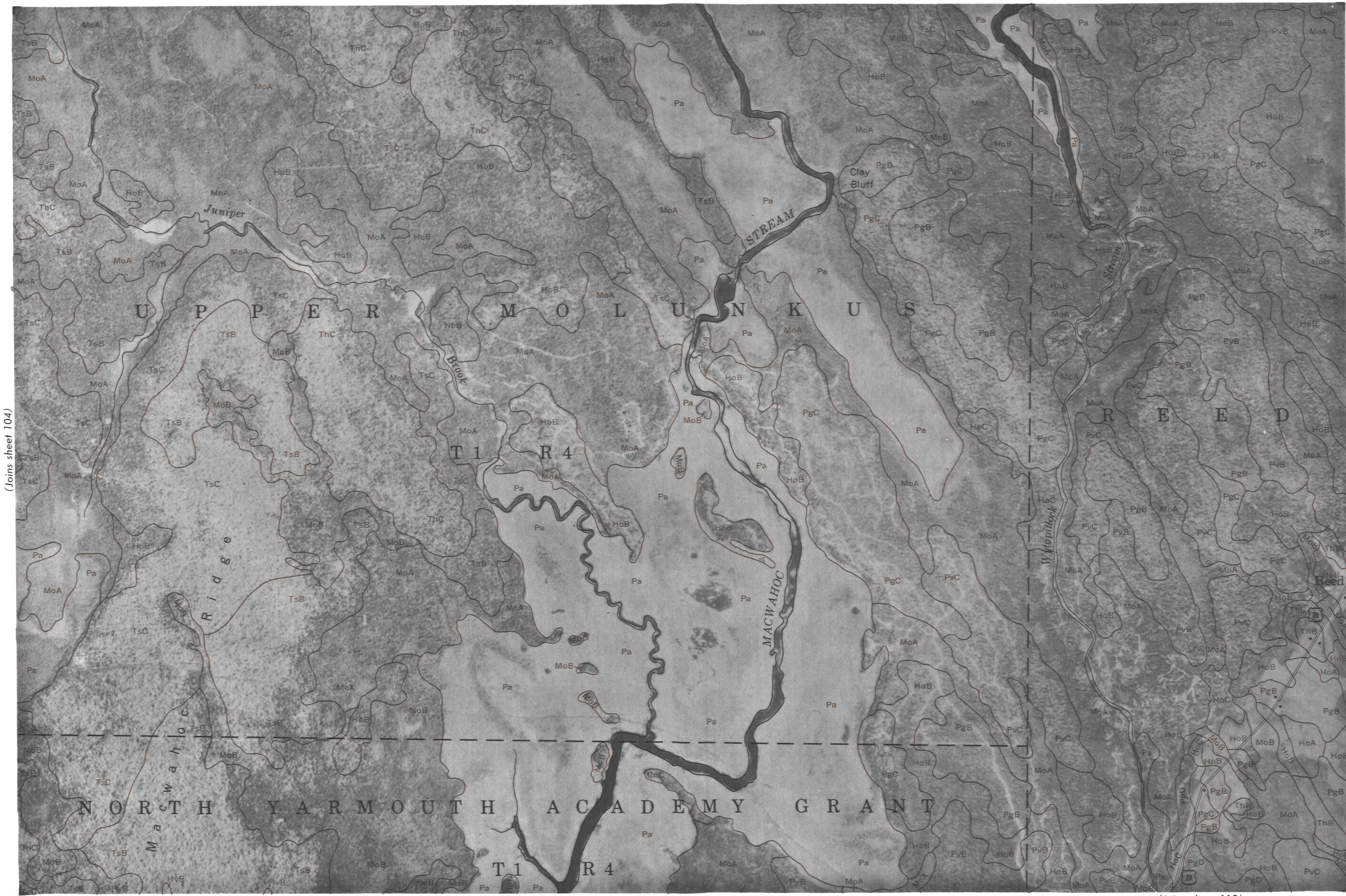
0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 98)

105

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

(Joins sheet 104)



(Joins sheet 106)

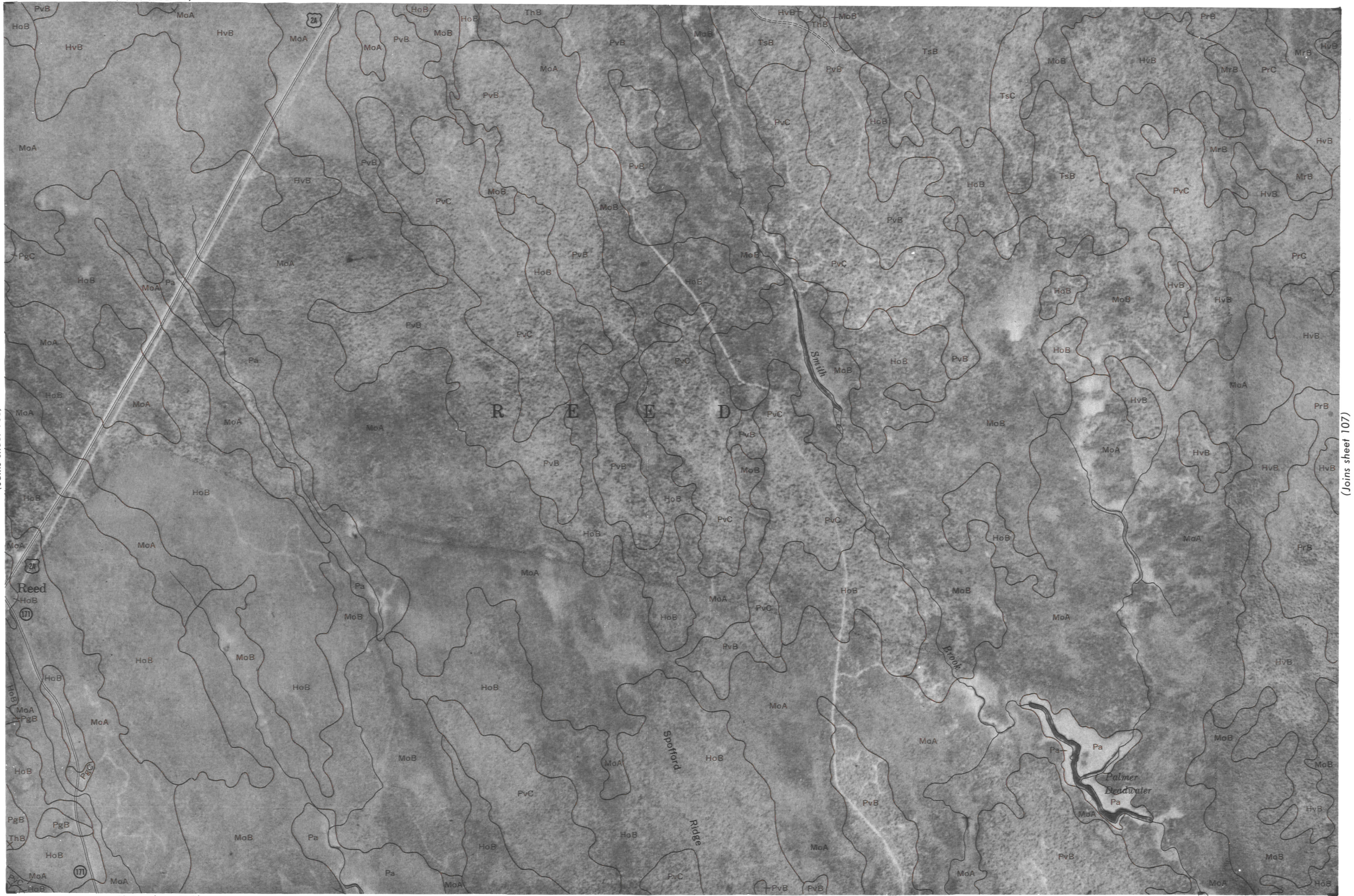
(Joins sheet 112)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

106

(Joins sheet 99)

(Joins sheet 105)



(Joins sheet 107)

(Joins sheet 113)

0 ½ 1 Mile Scale 1:20000 5000 Feet

(Joins sheet 100)

(Joins sheet 106)

(Joins sheet 108)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 114)

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

AROOSTOOK COUNTY, MAINE, SOUTHERN PART — SHEET NUMBER 108

(Joins sheet 101)

(Joins sheet 107)

(Joins sheet 109)

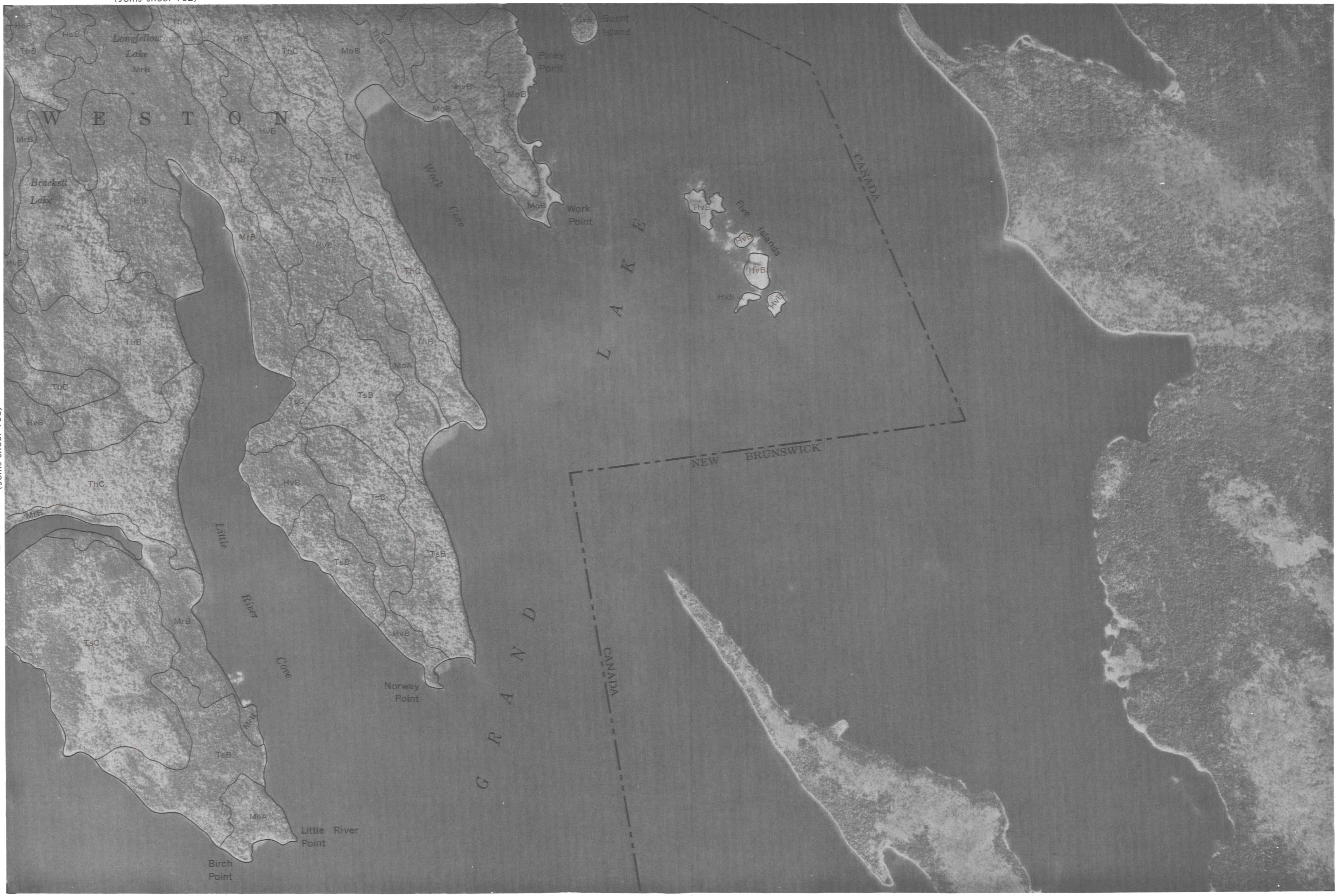
(Joins sheet 115)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 102)

109

(Joins sheet 108)



(Joins sheet 116)

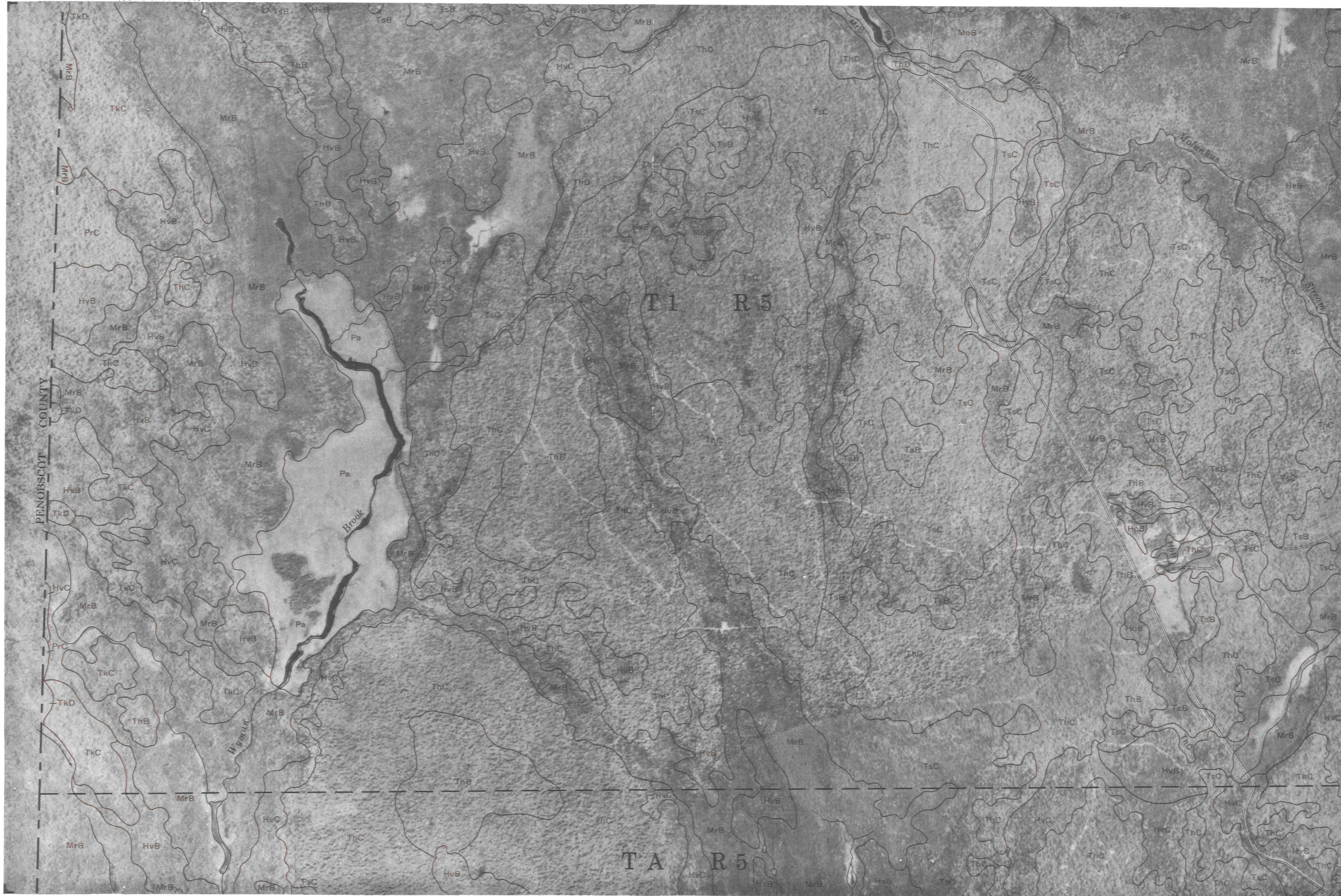
0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

AROOSTOOK COUNTY, MAINE, SOUTHERN PART — SHEET NUMBER 110

(Joins sheet 103)

N



(Joins sheet 111)

(Joins sheet 117)

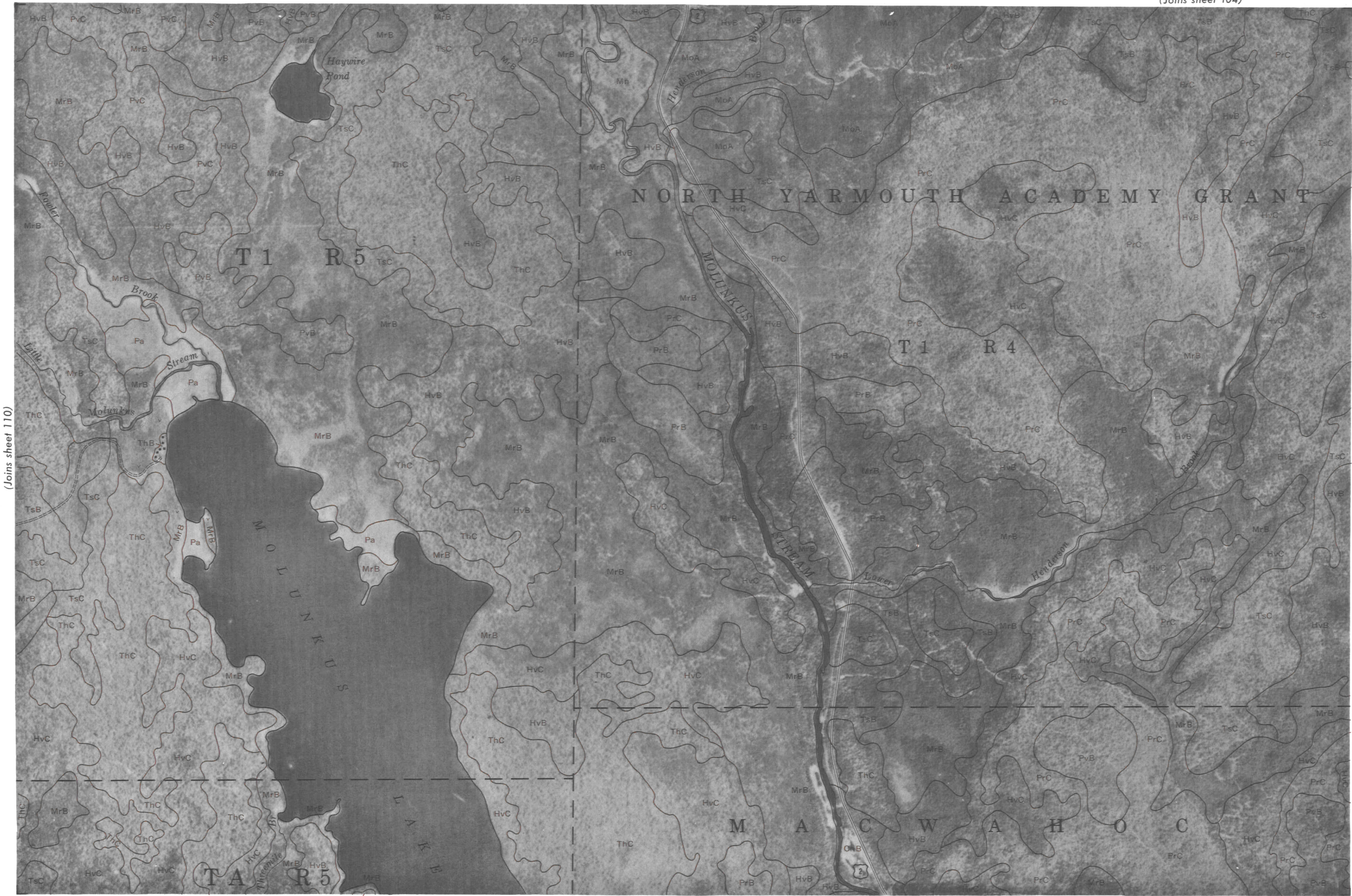
0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 104)

111

(Joins sheet 110)

(Joins sheet 112)



0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 118)

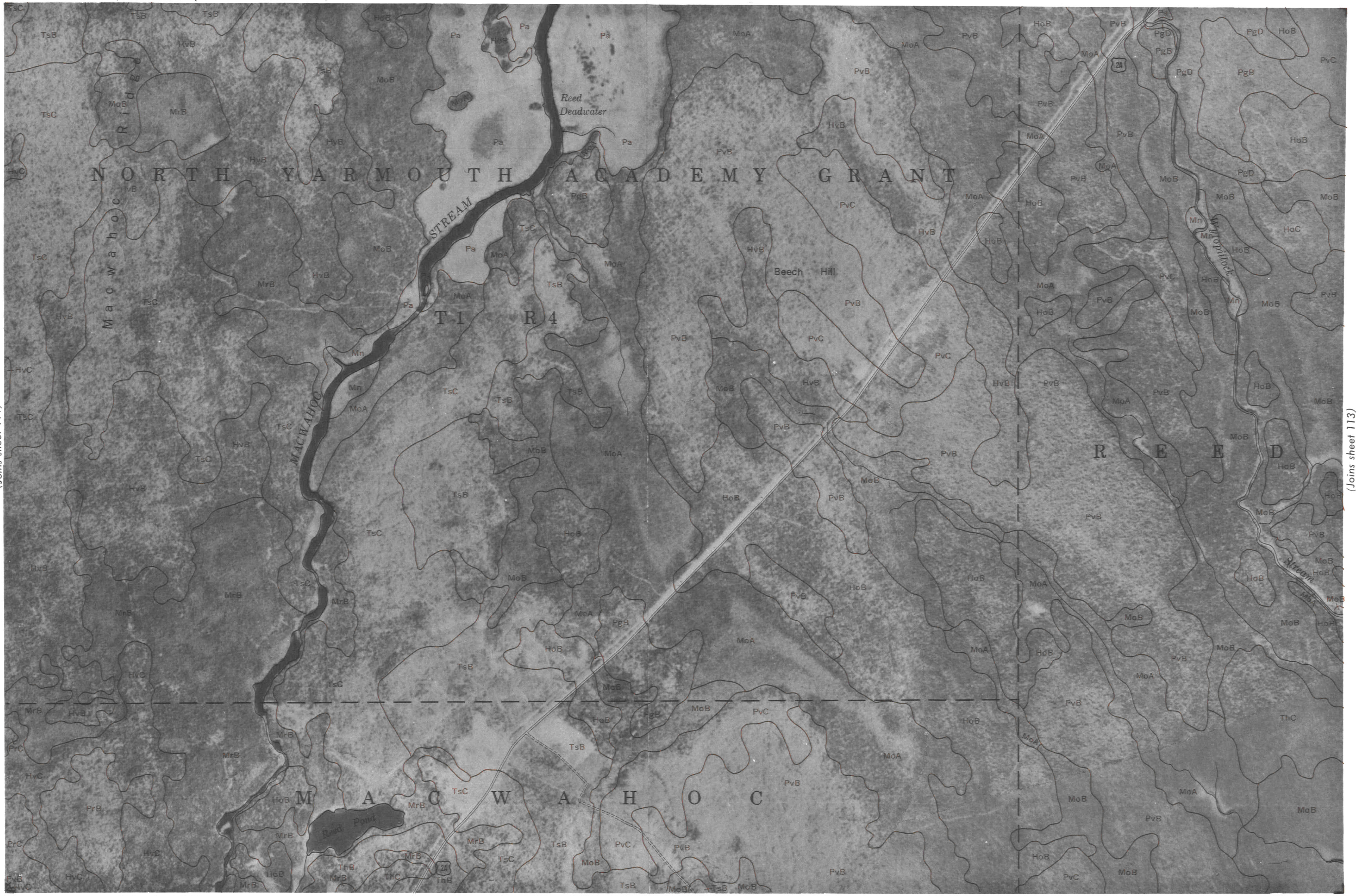
This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

112

(Joins sheet 105)

N

(Joins sheet 111)



(Joins sheet 113)

(Joins sheet 119)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Joins sheet 106)

113

N

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

(Joins sheet 112)

(Joins sheet 114)

(Joins sheet 120)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

114

(Joins sheet 107)

(Joins sheet 113)

(Joins sheet 115)

(Joins sheet 121)

0 ½ 1 Mile Scale 1: 20000 0 5000 Feet

(Joins sheet 108)

115

N

(Joins sheet 114)

(Joins sheet 116)

(Joins sheet 121)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

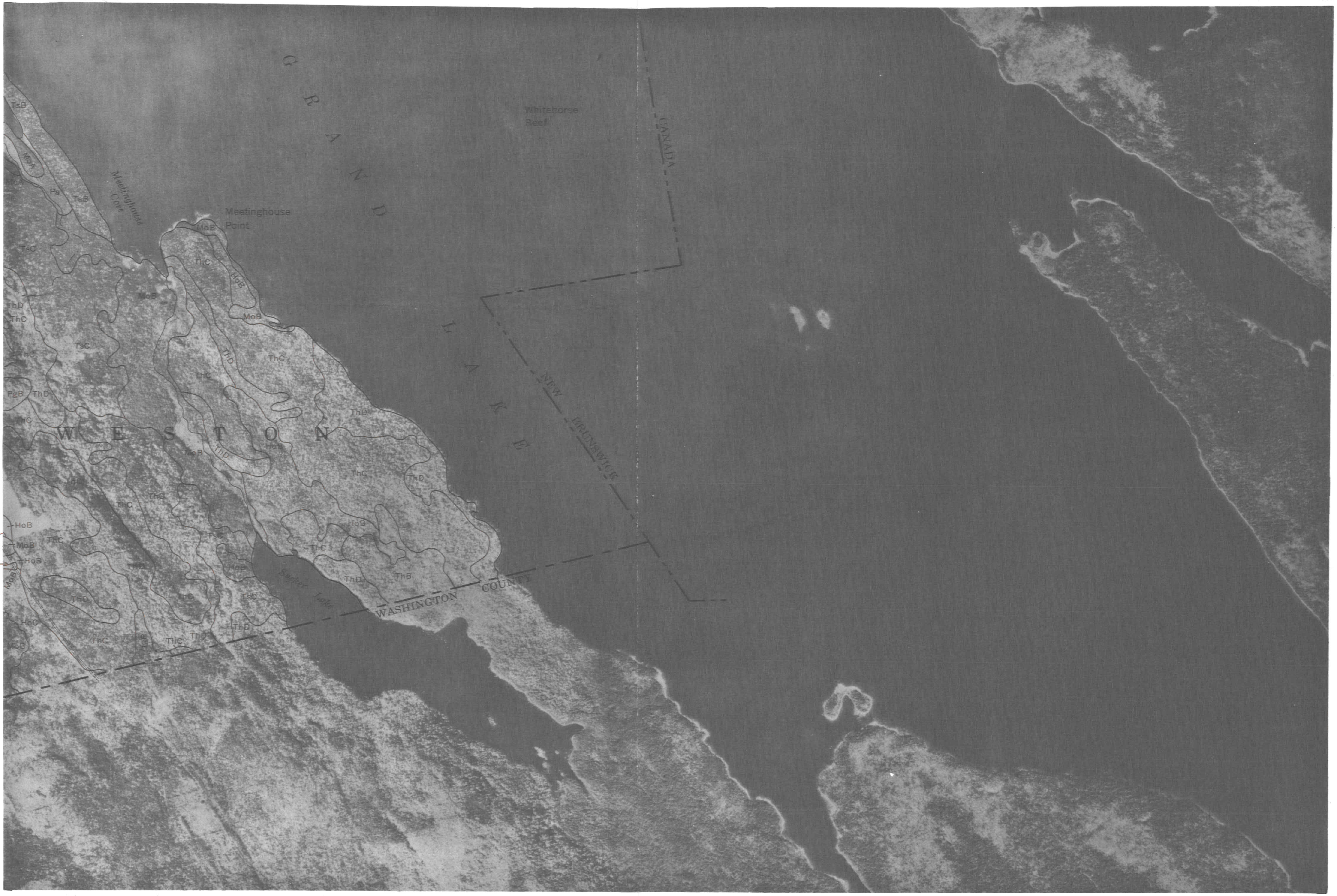
This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

116

(Joins sheet 109)

N

(Joins sheet 115)



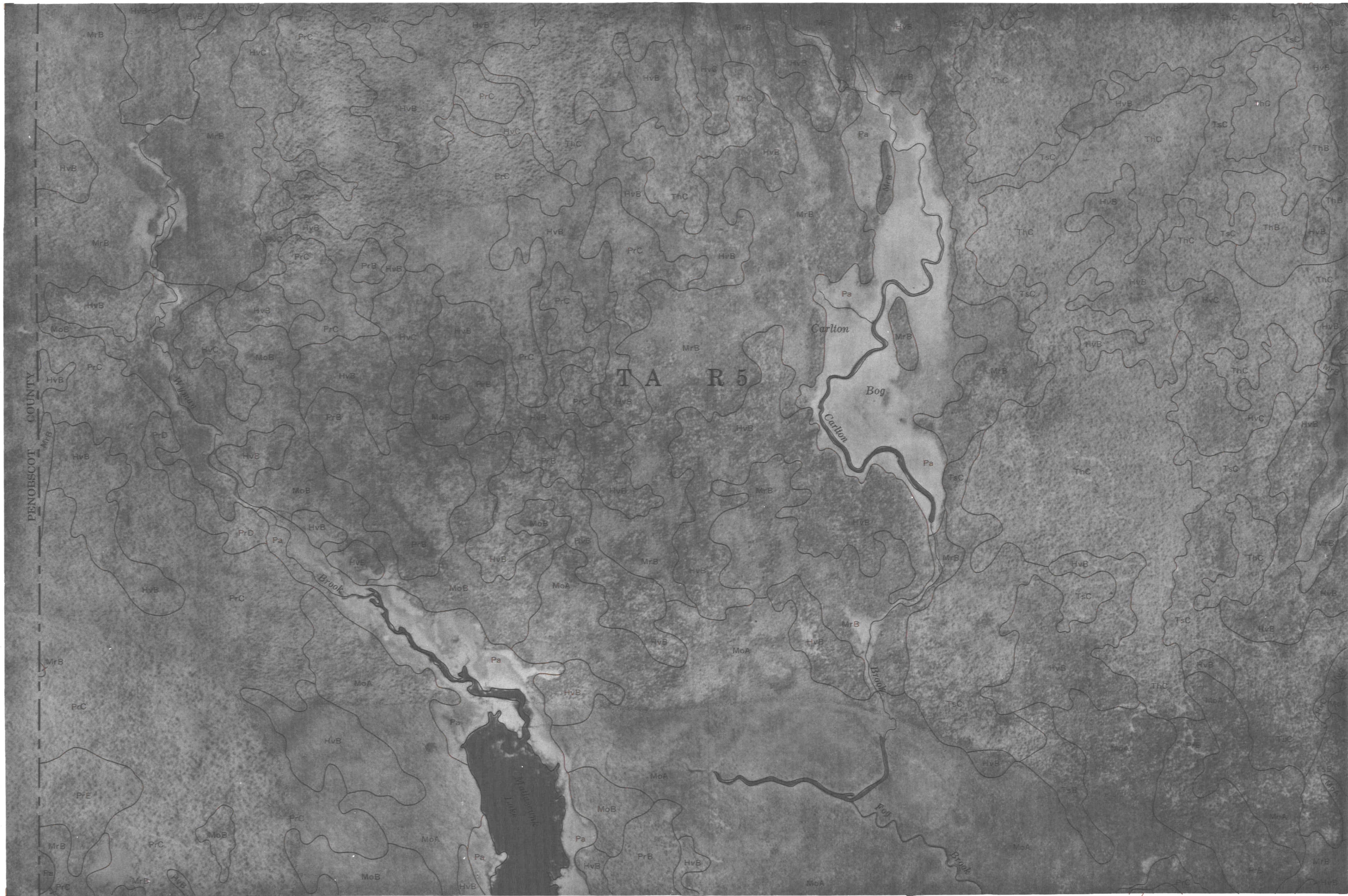
Scale 1:20000

0 ½ 1 Mile

0 5000 Feet

(Joins sheet 110)

117



0 ½ 1 Mile Scale 1:20000 0 5000 Feet

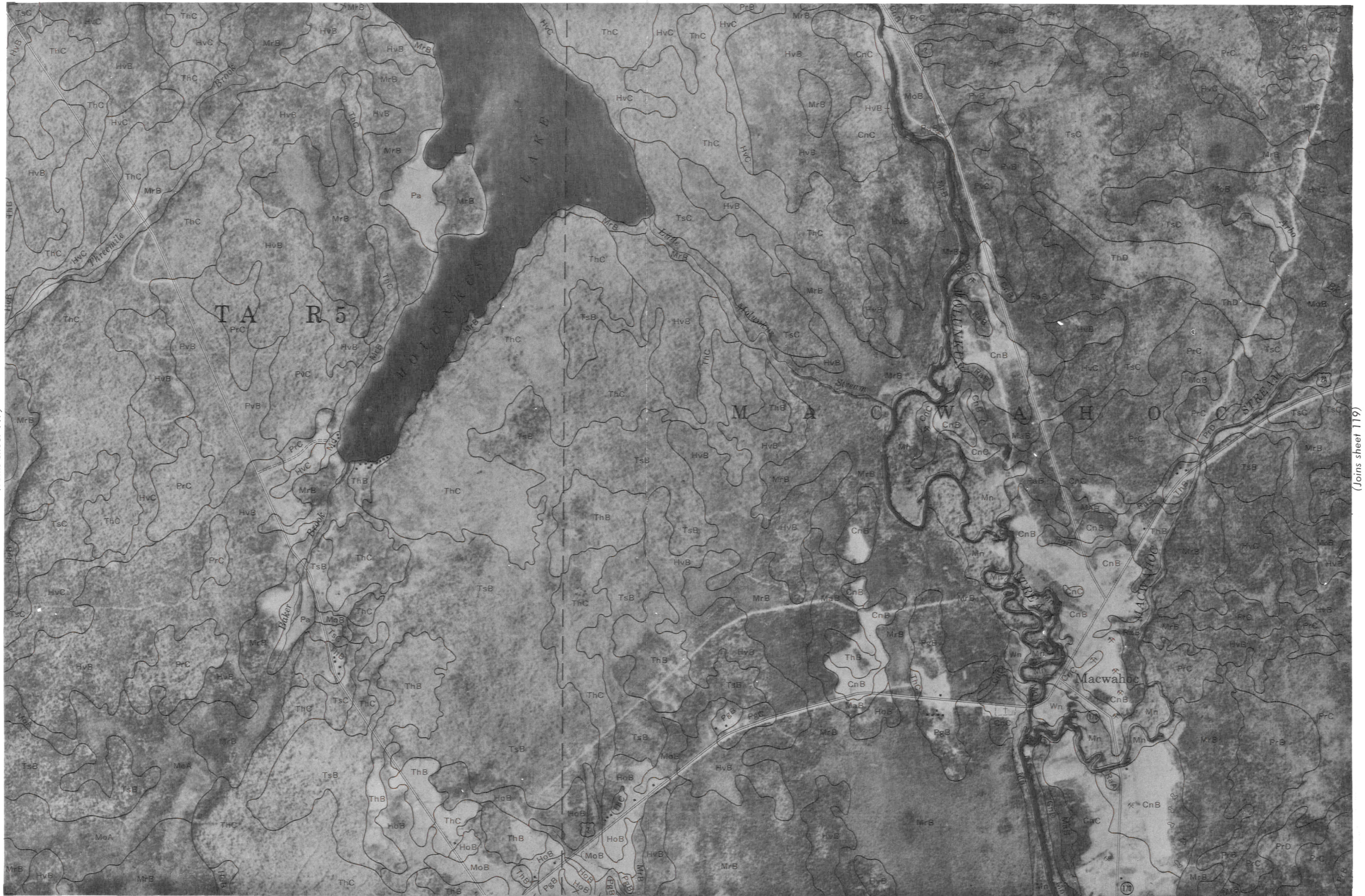
(Joins sheet 122)

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

(Joins sheet 111)

N

(Joins sheet 117)



(Joins sheet 119)

(Joins sheet 123)

MrB MrB PrC

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 112)

119

(Joins sheet 118)

(Joins sheet 120)

(Joins inset, sheet 123)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

120

(Joins sheet 113)

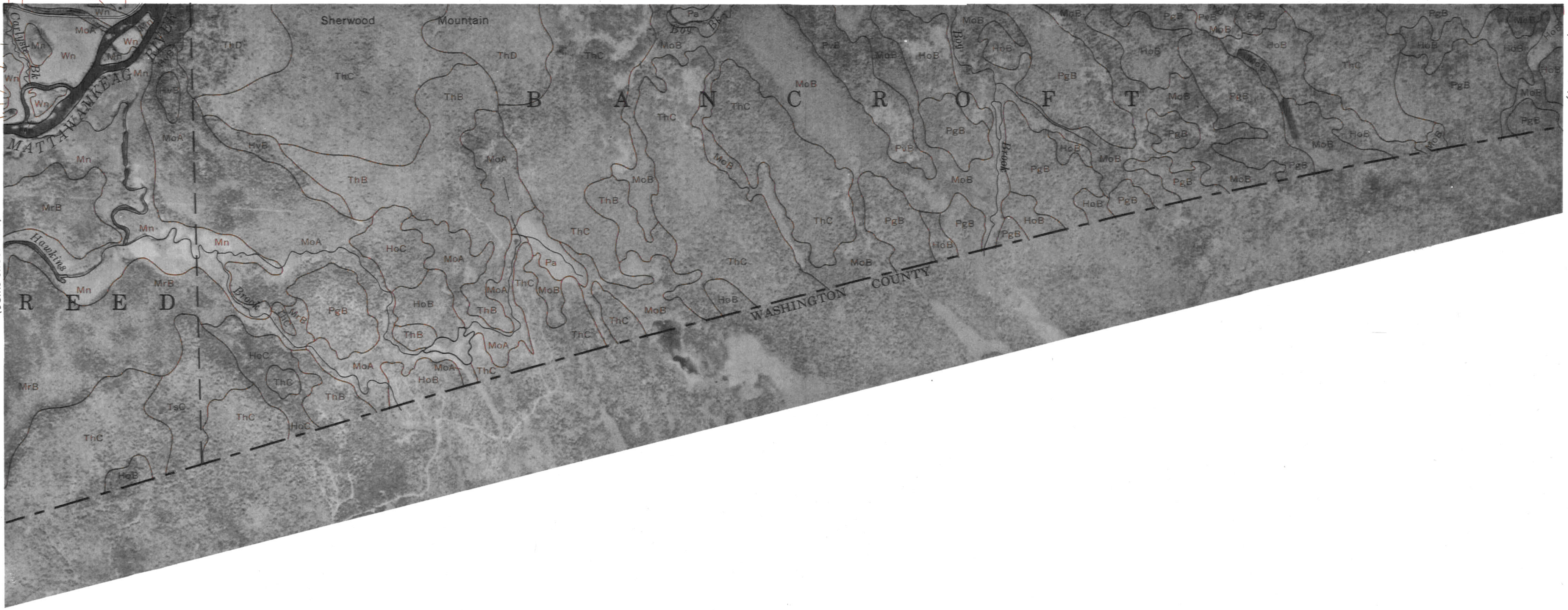
(Joins sheet 119)

(Joins sheet 121)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 114)

121

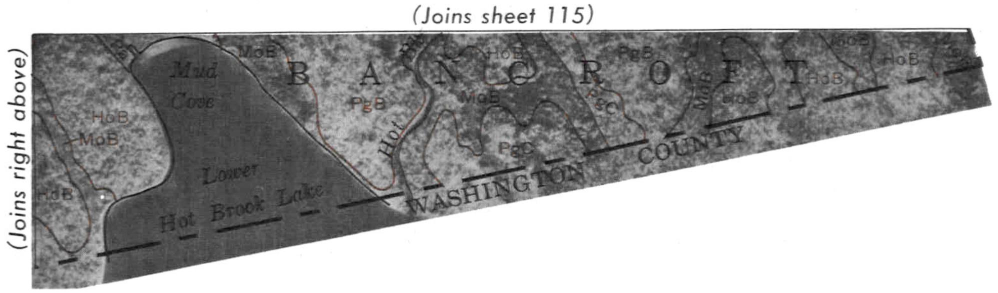


(Joins sheet 120)

(Joins inset)

(Joins sheet 115)

(Joins right above)



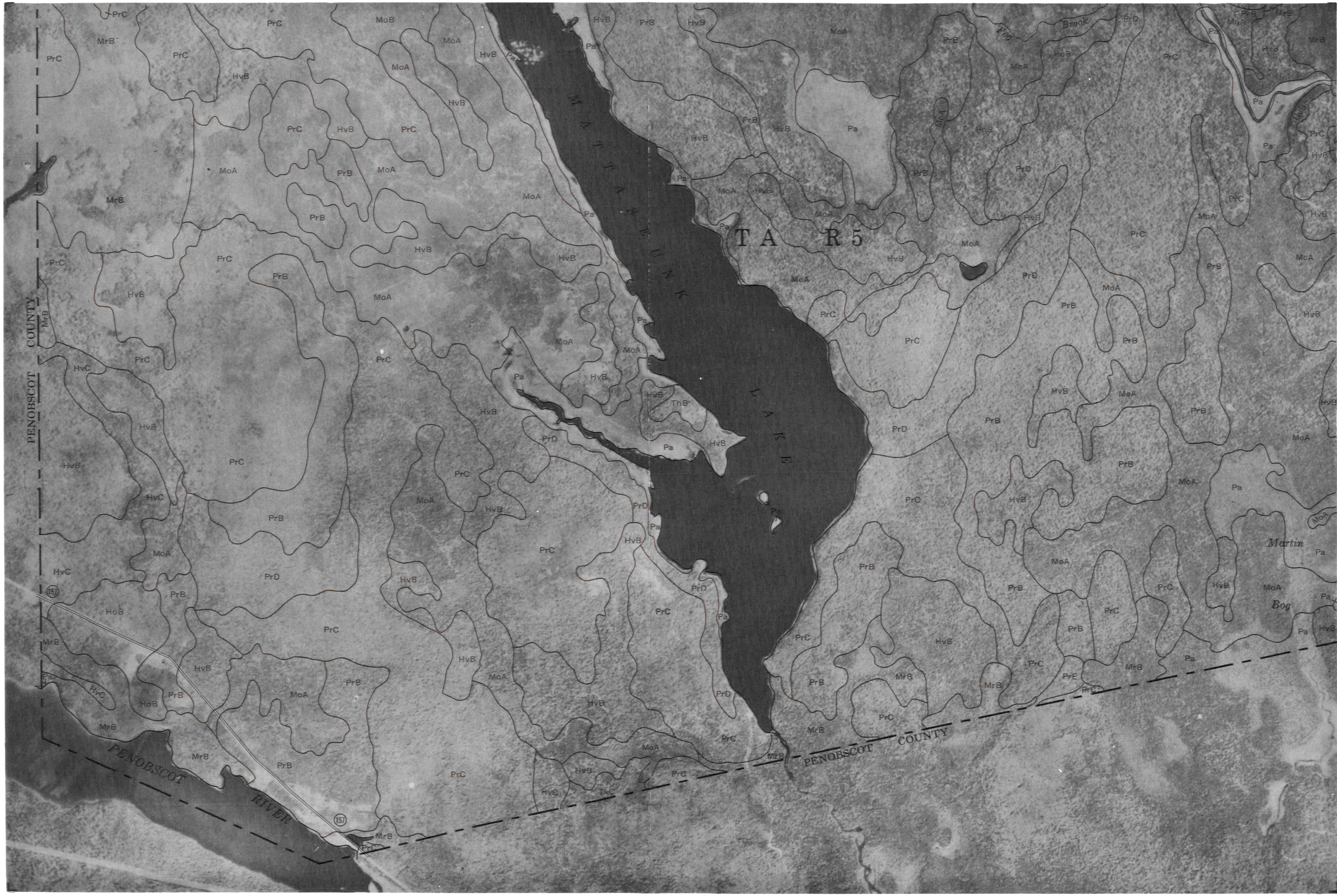
0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.

(Joins sheet 117)

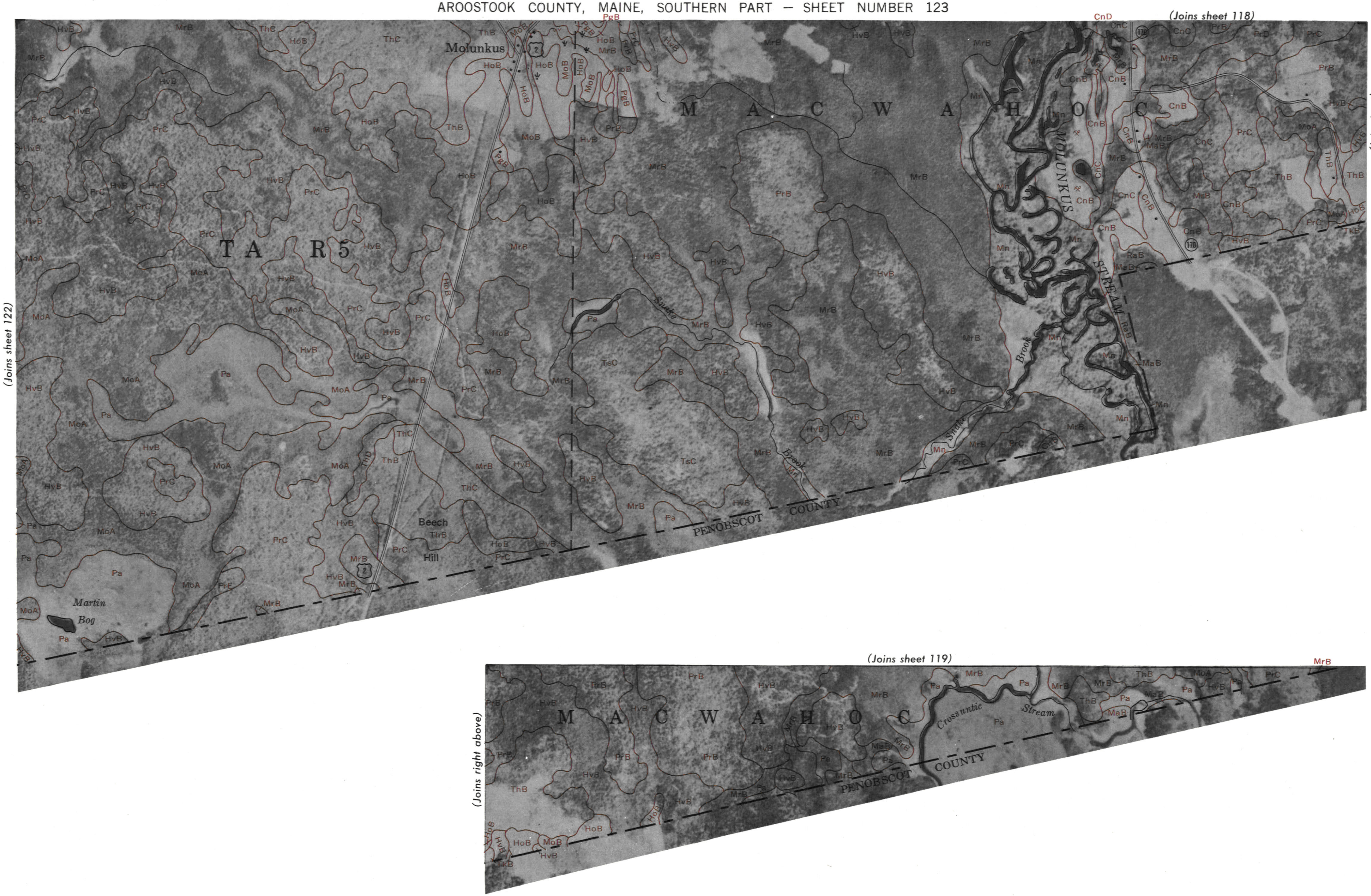
AROOSTOOK COUNTY, MAINE, SOUTHERN PART — SHEET NUMBER 122

N



(Joins sheet 123)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet



Scale 1: 20000

0 ½ 1 Mile

0 5000 Feet

This map is one of a set compiled in 1963 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Maine Agricultural Experiment Station.